



US009156637B2

(12) **United States Patent**
Asada et al.

(10) **Patent No.:** **US 9,156,637 B2**
(45) **Date of Patent:** **Oct. 13, 2015**

(54) **TRAY UNIT AND IMAGE RECORDING DEVICE**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(75) Inventors: **Tetsuo Asada**, Kuwana (JP); **Satoru Nakakita**, Nagoya (JP)

3,989,236	A	11/1976	Komori et al.	
4,056,835	A *	11/1977	Whitney et al.	360/251
4,131,274	A *	12/1978	Sue	271/9.11
4,135,805	A *	1/1979	Taylor et al.	399/379
4,645,192	A *	2/1987	Watanabe	271/9.09
4,928,129	A	5/1990	Honda	
5,357,385	A *	10/1994	Shimizu et al.	360/96.51

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 467 days.

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **13/242,214**

CN	101445191	A	6/2009
JP	02225228	A *	9/1990

(Continued)

(22) Filed: **Sep. 23, 2011**

OTHER PUBLICATIONS

(65) **Prior Publication Data**

US 2012/0081488 A1 Apr. 5, 2012

Machine translation for Asada (JP Pat 2010159162A).*

(Continued)

(30) **Foreign Application Priority Data**

Sep. 30, 2010 (JP) 2010-223029

Primary Examiner — Julian Huffman

Assistant Examiner — Leonard S Liang

(74) *Attorney, Agent, or Firm* — Baker Botts L.L.P.

(57)

ABSTRACT

A tray unit includes a first tray, a second tray, and a cover. The first tray includes a first holding surface for holding thereon a first sheet. The second tray includes a second holding surface for holding thereon a second sheet. The second tray is configured to slide above and along the first holding surface between a first second-tray position and a second second-tray position, and is configured to pivot between the second second-tray position and a third second-tray position in which the second tray stands upward with respect to the first holding surface. The cover is configured to cover from above at least a part of the second tray when the second tray is in the second second-tray position, and is configured to pivot between a first cover position in which the cover extends along the first holding surface and a second cover position in which the cover stands upward with respect to the first holding surface.

(51) **Int. Cl.**

B41J 2/01 (2006.01)

B65H 3/06 (2006.01)

B41J 17/26 (2006.01)

B65H 1/26 (2006.01)

(52) **U.S. Cl.**

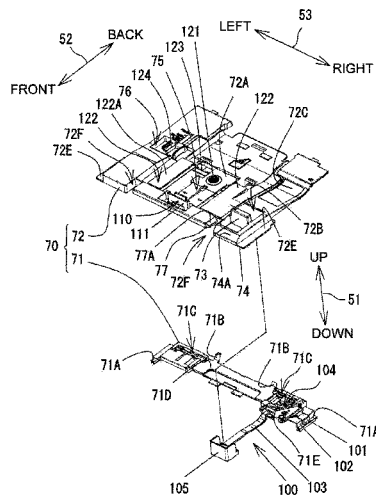
CPC **B65H 3/0684** (2013.01); **B41J 17/26** (2013.01); **B65H 1/266** (2013.01); **B65H 2402/46** (2013.01); **B65H 2405/115** (2013.01); **B65H 2405/11164** (2013.01); **B65H 2405/324** (2013.01); **B65H 2405/332** (2013.01)

(58) **Field of Classification Search**

USPC 347/104, 101, 108; 271/9.08, 9.07, 271/9.11, 162, 164

See application file for complete search history.

28 Claims, 15 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

5,647,585	A	7/1997	Cheong	
6,659,444	B2	12/2003	Kawarama	
7,403,739	B2	7/2008	Hwang	
7,497,565	B2 *	3/2009	Kinoshita et al.	347/101
7,547,011	B2	6/2009	Kurata et al.	
7,584,950	B2	9/2009	Asada et al.	
7,600,745	B2	10/2009	Asada	
7,628,392	B2	12/2009	Shiohara et al.	
7,654,515	B2	2/2010	Koga	
7,677,548	B2	3/2010	Chino	
7,681,875	B2	3/2010	Asada et al.	
7,690,640	B2	4/2010	Koga et al.	
7,694,951	B2 *	4/2010	Shiohara	271/9.08
7,694,952	B2	4/2010	Sosnowski et al.	
7,731,179	B2 *	6/2010	Izuchi et al.	271/145
7,748,692	B2	7/2010	Shiohara	
7,850,170	B2 *	12/2010	Matsue et al.	271/294
7,862,037	B2 *	1/2011	Kunioka	271/171
7,878,500	B2	2/2011	Wakakusa	
7,883,284	B2 *	2/2011	Asada et al.	400/624
8,020,849	B2 *	9/2011	Izuchi et al.	271/9.11
2005/0052518	A1 *	3/2005	Kagami	347/104
2005/0225025	A1	10/2005	Chikumoto	
2006/0017794	A1 *	1/2006	Kinoshita et al.	347/104
2006/0113723	A1 *	6/2006	Ito et al.	271/162
2006/0262355	A1	11/2006	Kurata et al.	
2007/0013760	A1 *	1/2007	Takahashi	347/104
2007/0075476	A1	4/2007	Shiohara	
2007/0182803	A1	8/2007	Asada et al.	
2007/0200285	A1 *	8/2007	Shiohara	271/162
2007/0201921	A1 *	8/2007	Asada et al.	399/393
2007/0201923	A1	8/2007	Asada et al.	
2008/0023023	A1 *	1/2008	Boye et al.	132/294
2008/0237977	A1 *	10/2008	Izuchi et al.	271/264
2009/0001652	A1	1/2009	Asada	
2009/0140484	A1	6/2009	Asada	
2009/0206539	A1	8/2009	Takeuchi et al.	
2010/0164169	A1	7/2010	Wakakusa	
2011/0241288	A1	10/2011	Asada et al.	
2012/0080833	A1	4/2012	Asada et al.	
2012/0081489	A1	4/2012	Asada et al.	

FOREIGN PATENT DOCUMENTS

JP	H06-008138	Y2	3/1994
JP	H08-12096	A	1/1996
JP	2006-347767	A	12/2006
JP	2007-230777	A	9/2007
JP	2009-020257	A	1/2009
JP	2009-107846	A	5/2009
JP	2010-037095	A	2/2010
JP	2010-159162	A	7/2010

OTHER PUBLICATIONS

United States Patent and Trademark Office, Office Action for U.S. Appl. No. 12/894,030 (counterpart to above-captioned patent application), mailed Feb. 16, 2012.

United States Patent and Trademark Office, Non Final Office Action for U.S. Appl. No. 13/841,947 (related to above-captioned patent application), mailed Jul. 15, 2013.

United States Patent and Trademark Office, Office Action for U.S. Appl. No. 12/894,030 (co-pending U.S. patent application), mailed Aug. 1, 2012.

United States Patent and Trademark Office, Office Action for U.S. Appl. No. 13/242,395 (co-pending U.S. patent application), mailed Sep. 11, 2012.

Japan Patent Office, Notice of Reasons for Rejection for Japanese Patent Application No. 2010-223029 (related to above-captioned patent application), mailed Jan. 21, 2014.

Japan Patent Office, Notice of Reasons for Rejection for Japanese Patent Application No. 2010-223032 (related to above-captioned patent application), mailed Feb. 4, 2014.

Japan Patent Office, Notice of Reasons for Rejection for Japanese Patent Application No. 2010-223116 (related to above-captioned patent application), mailed Feb. 4, 2014.

United States Patent and Trademark Office, Final Rejection for U.S. Appl. No. 13/841,947 (related to above-captioned patent application), mailed Jan. 27, 2014.

State Intellectual Property Office of the People's Republic of China, Notification of First Office Action for Chinese Patent Application No. 201110302111.4 (counterpart to above-captioned patent application), mailed Dec. 27, 2013.

* cited by examiner

Fig.1

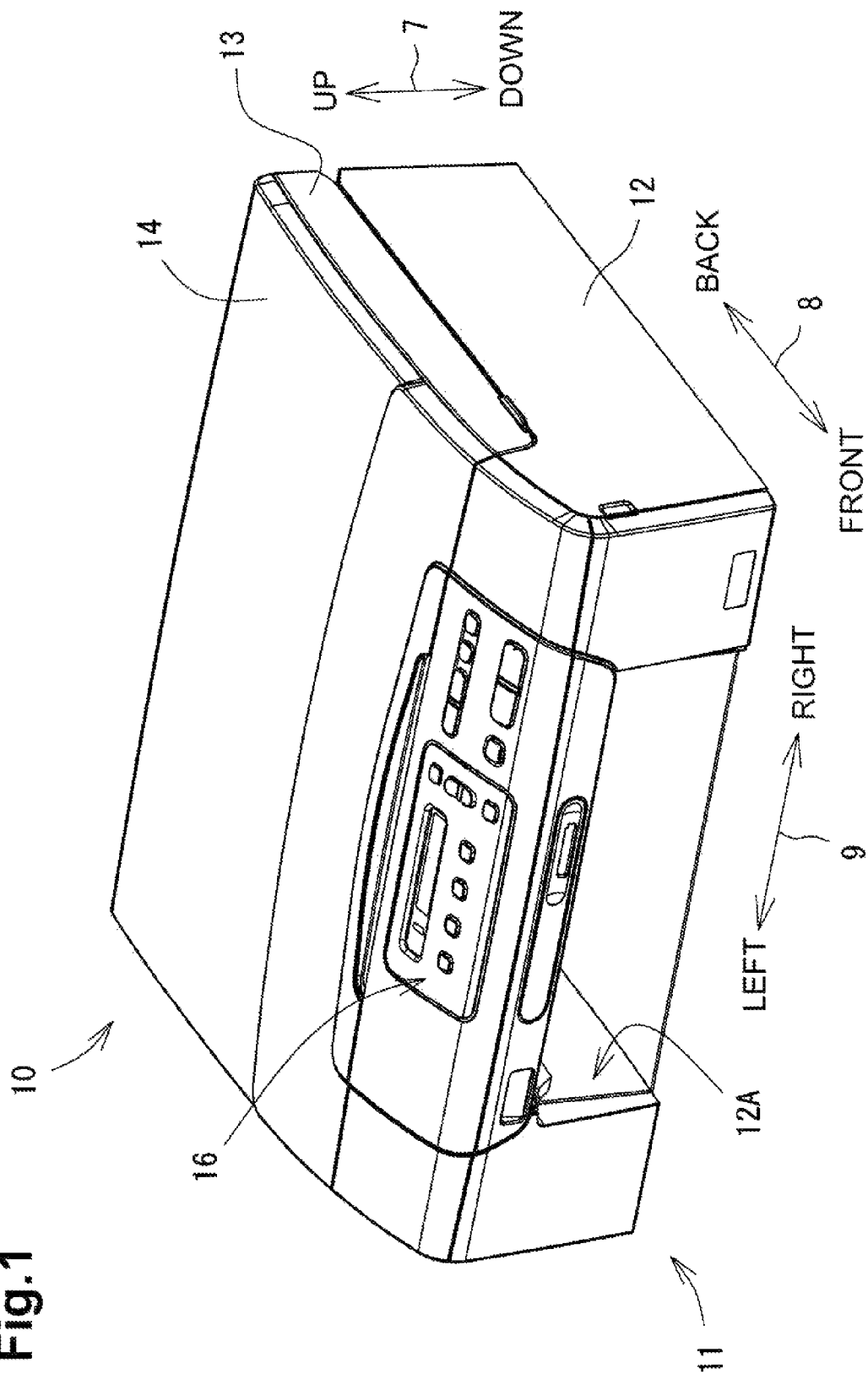


Fig. 2

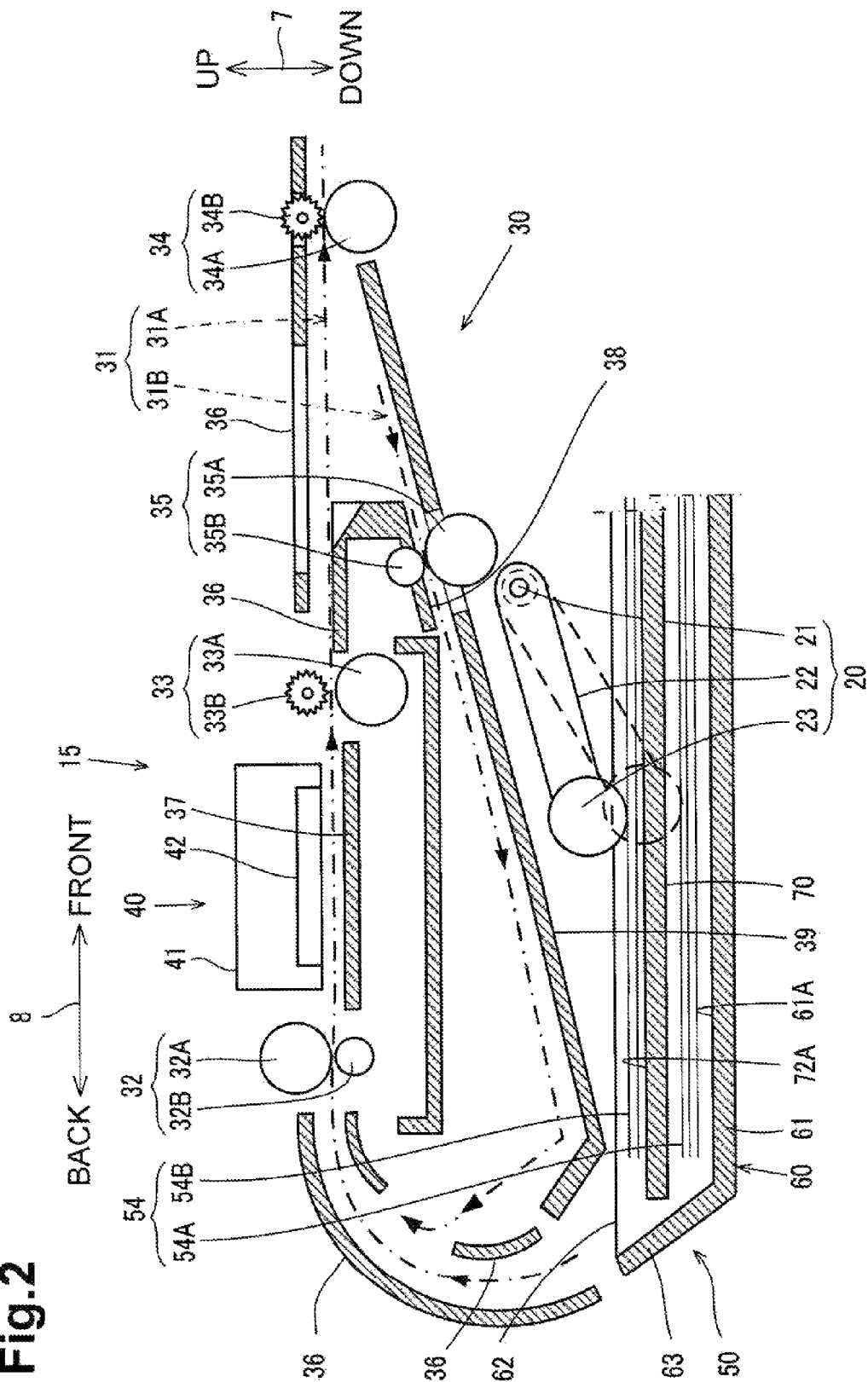


Fig.3A

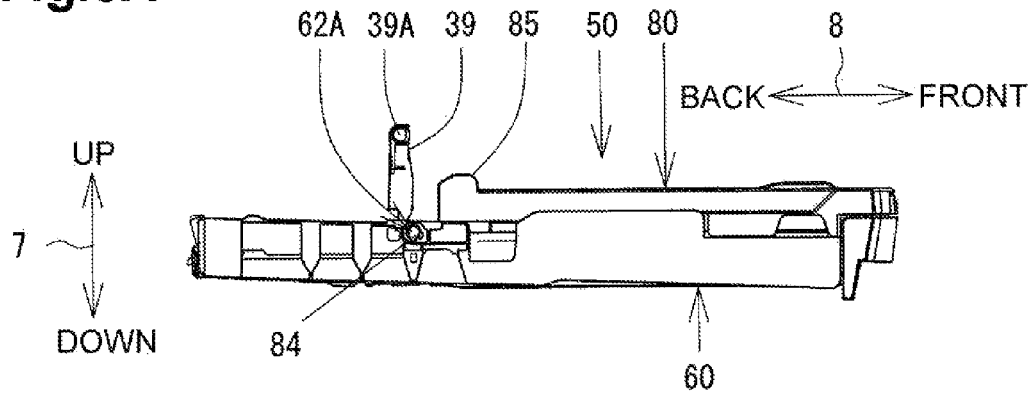


Fig.3B

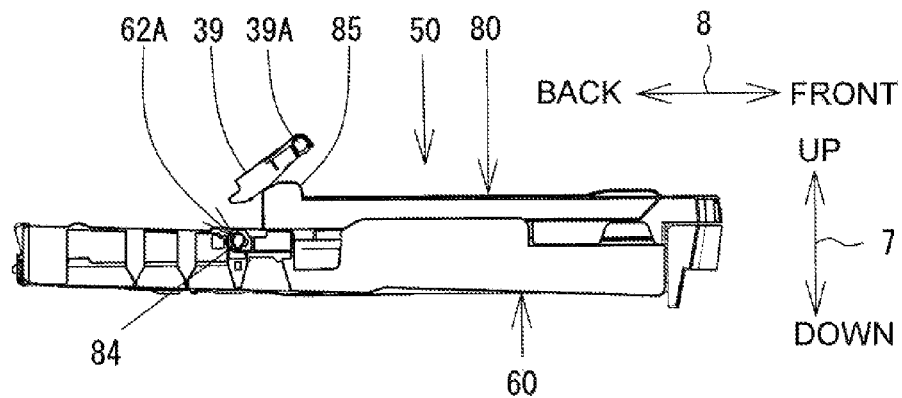


Fig.3C

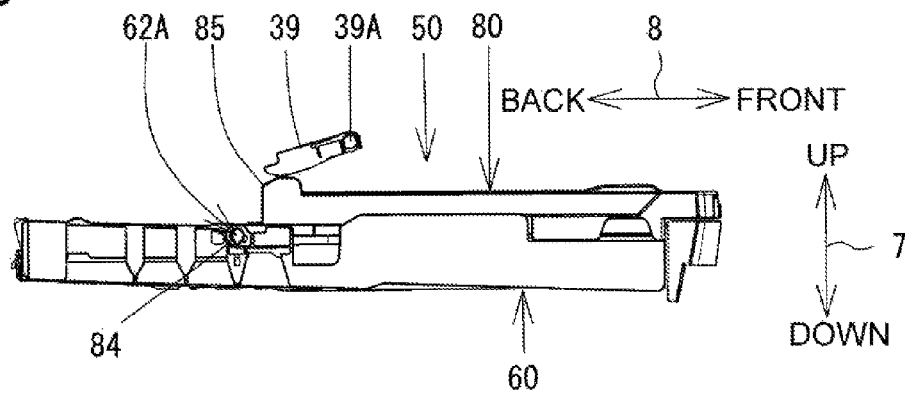


Fig.4

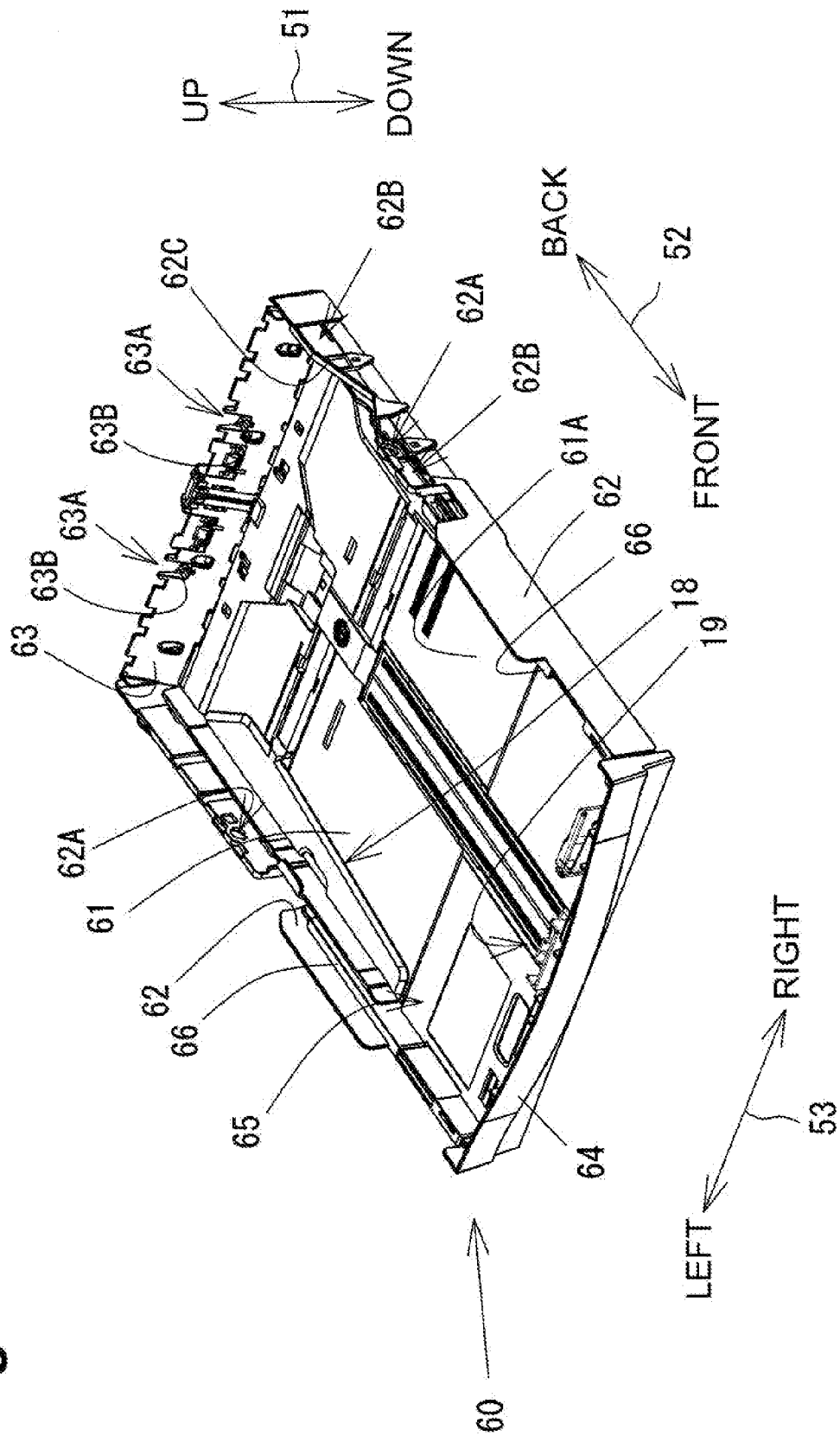


Fig. 5

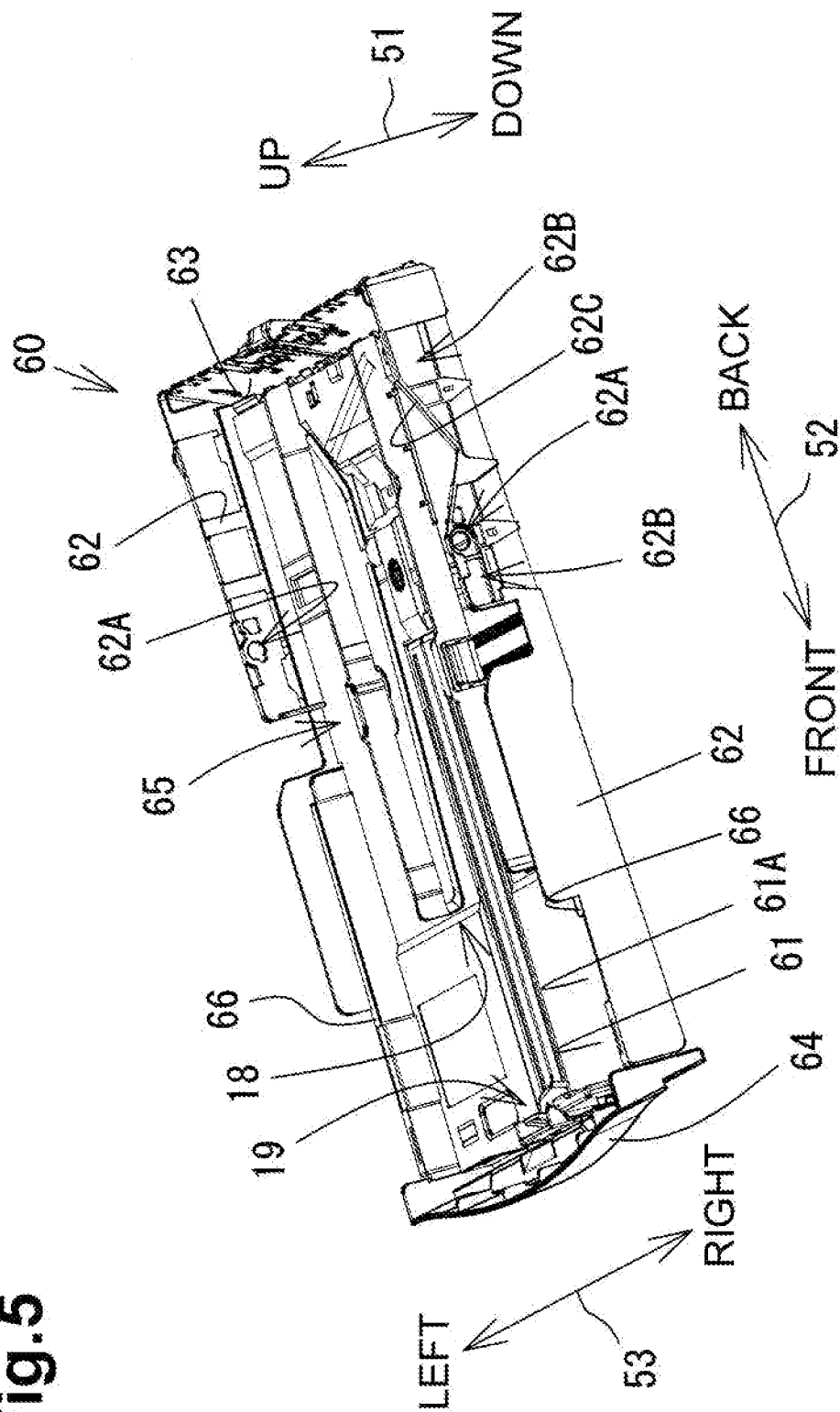


Fig.6

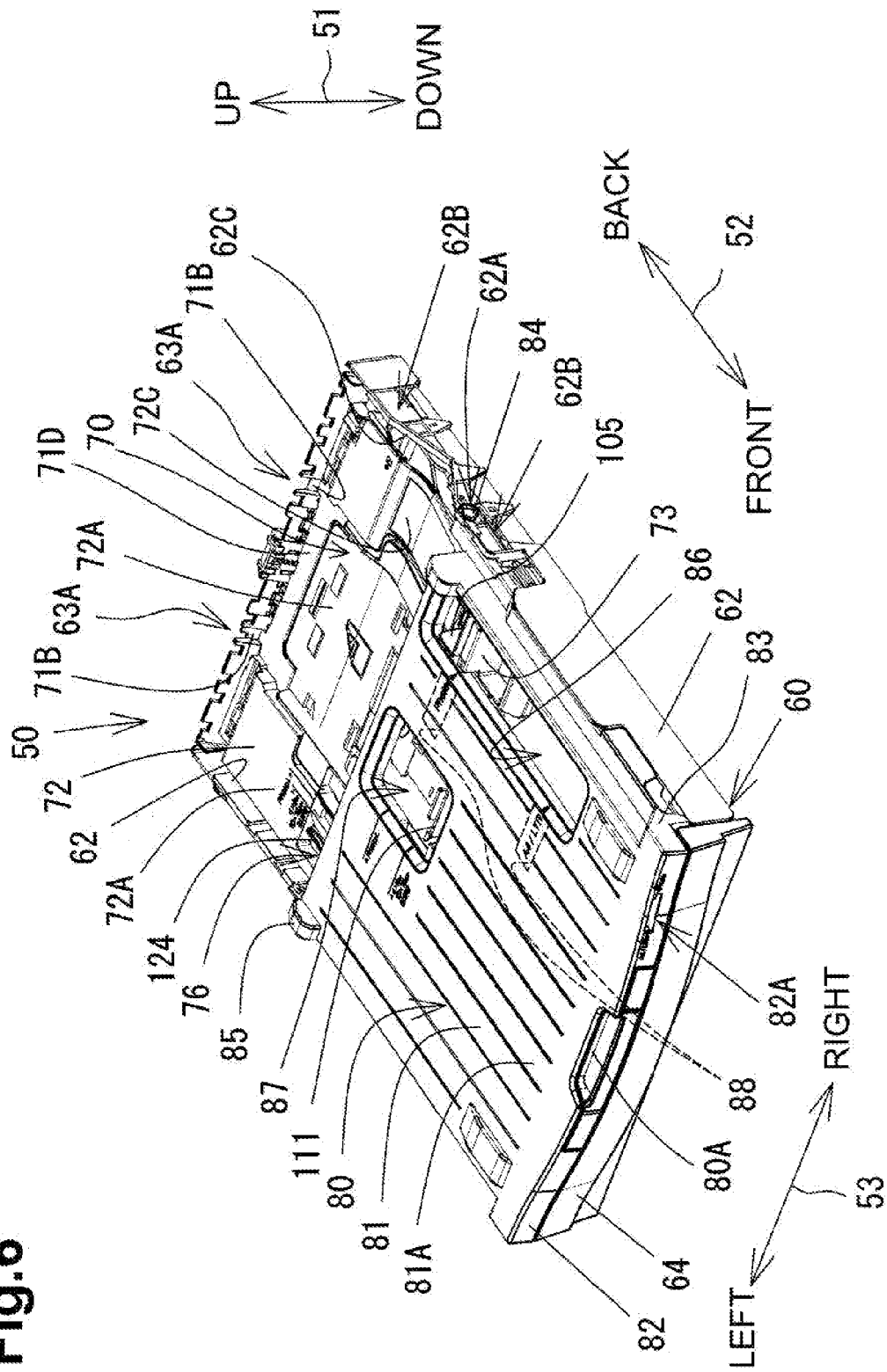
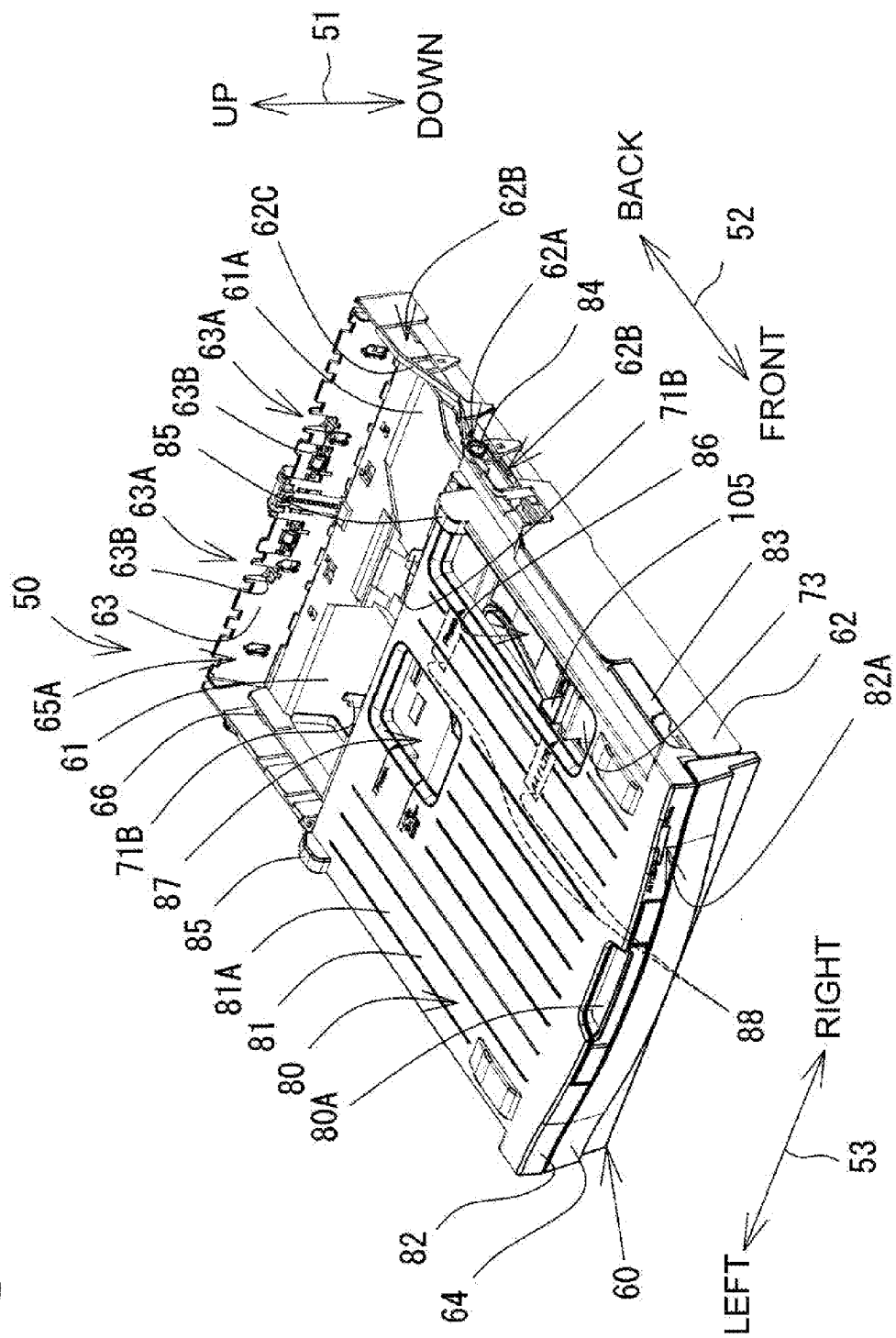


Fig. 7.



9.9.1

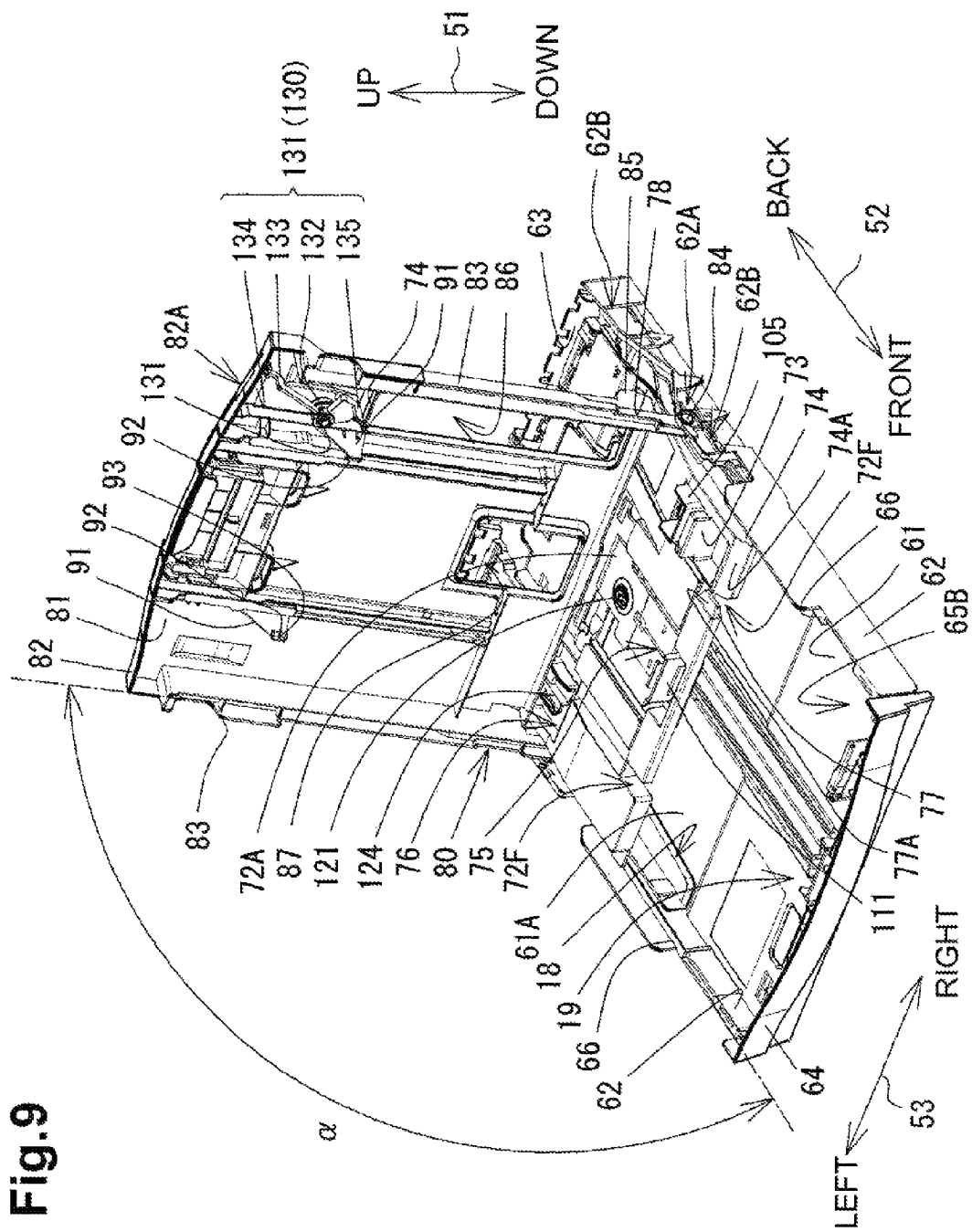


Fig.10

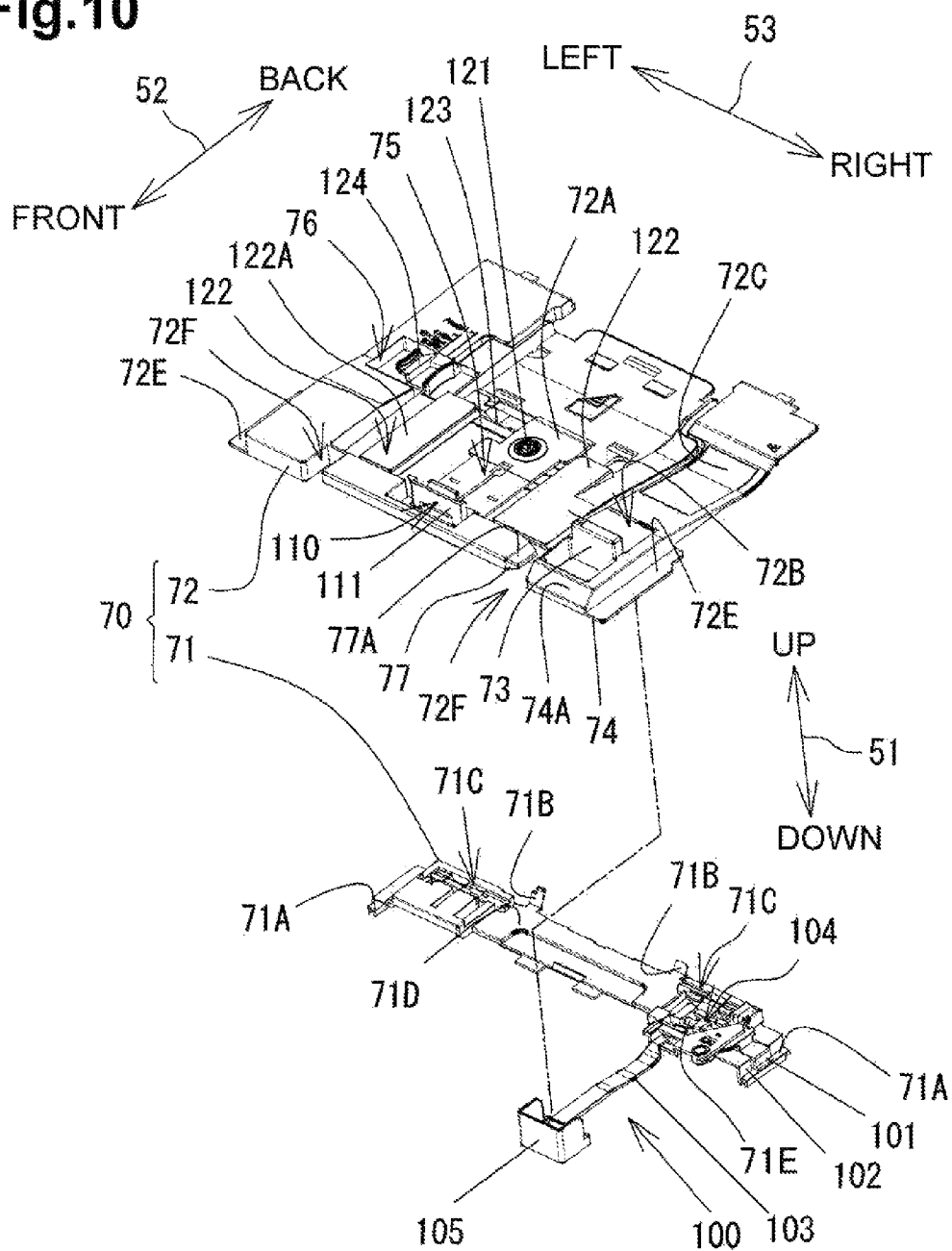


Fig. 11

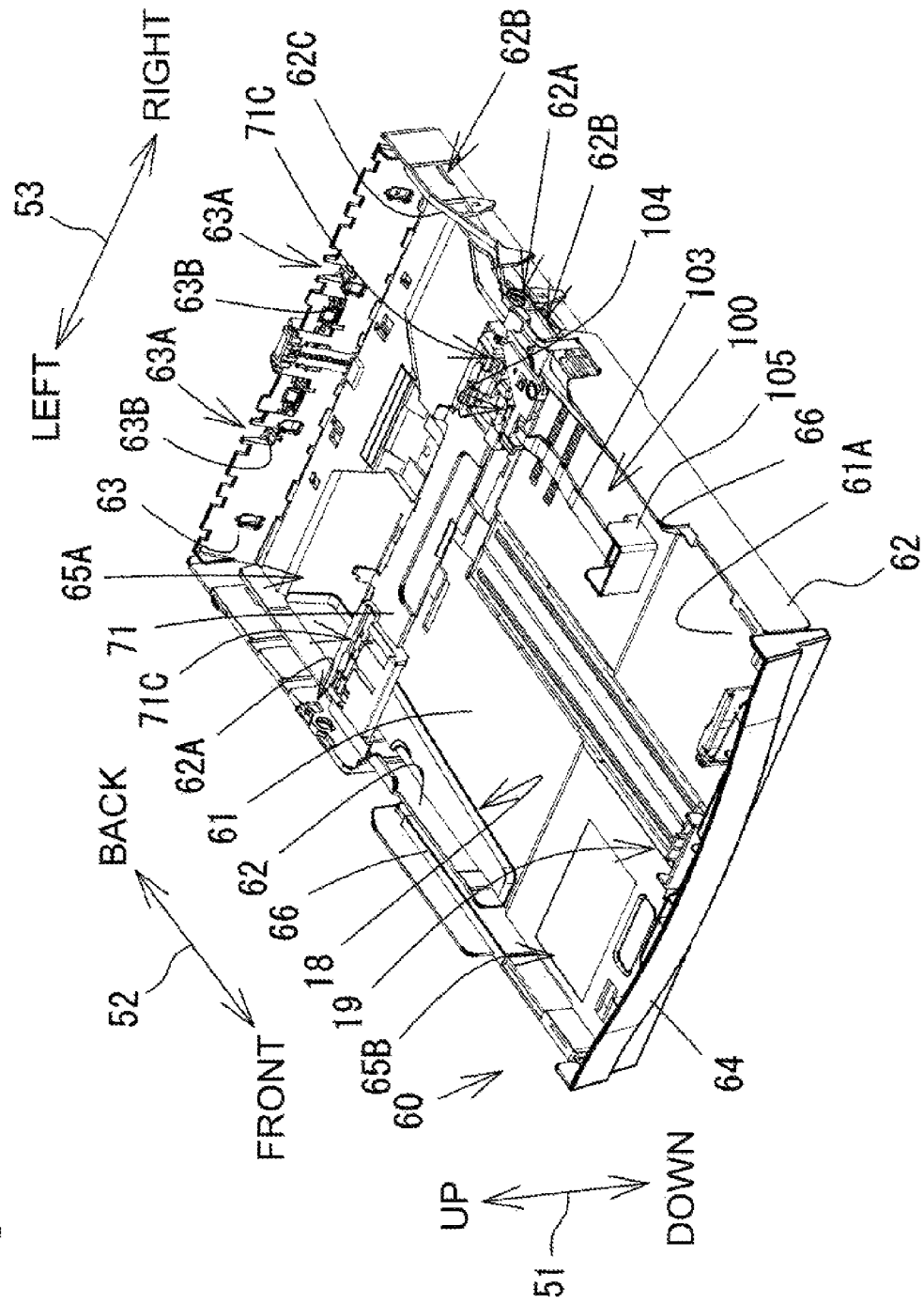


Fig. 12

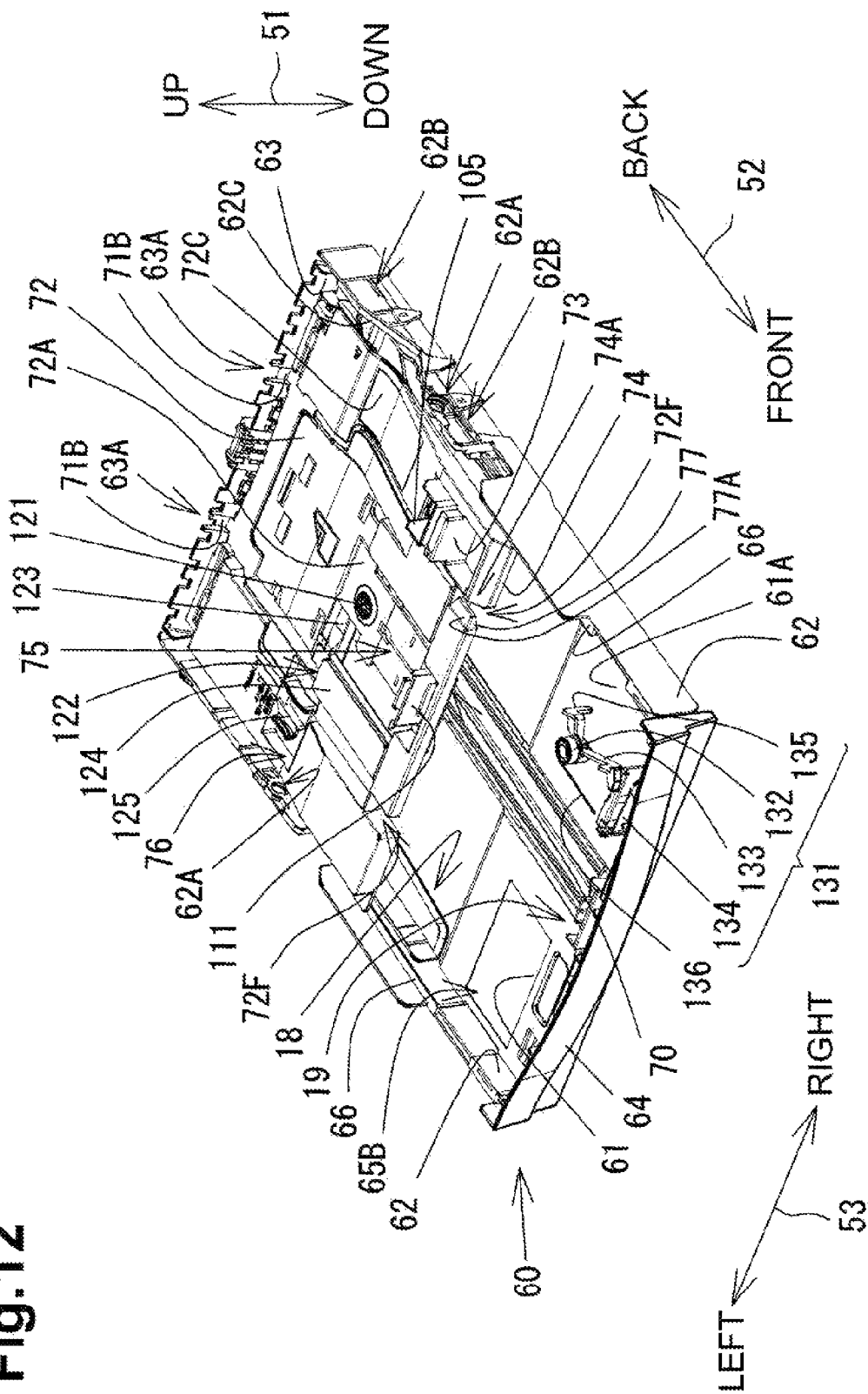
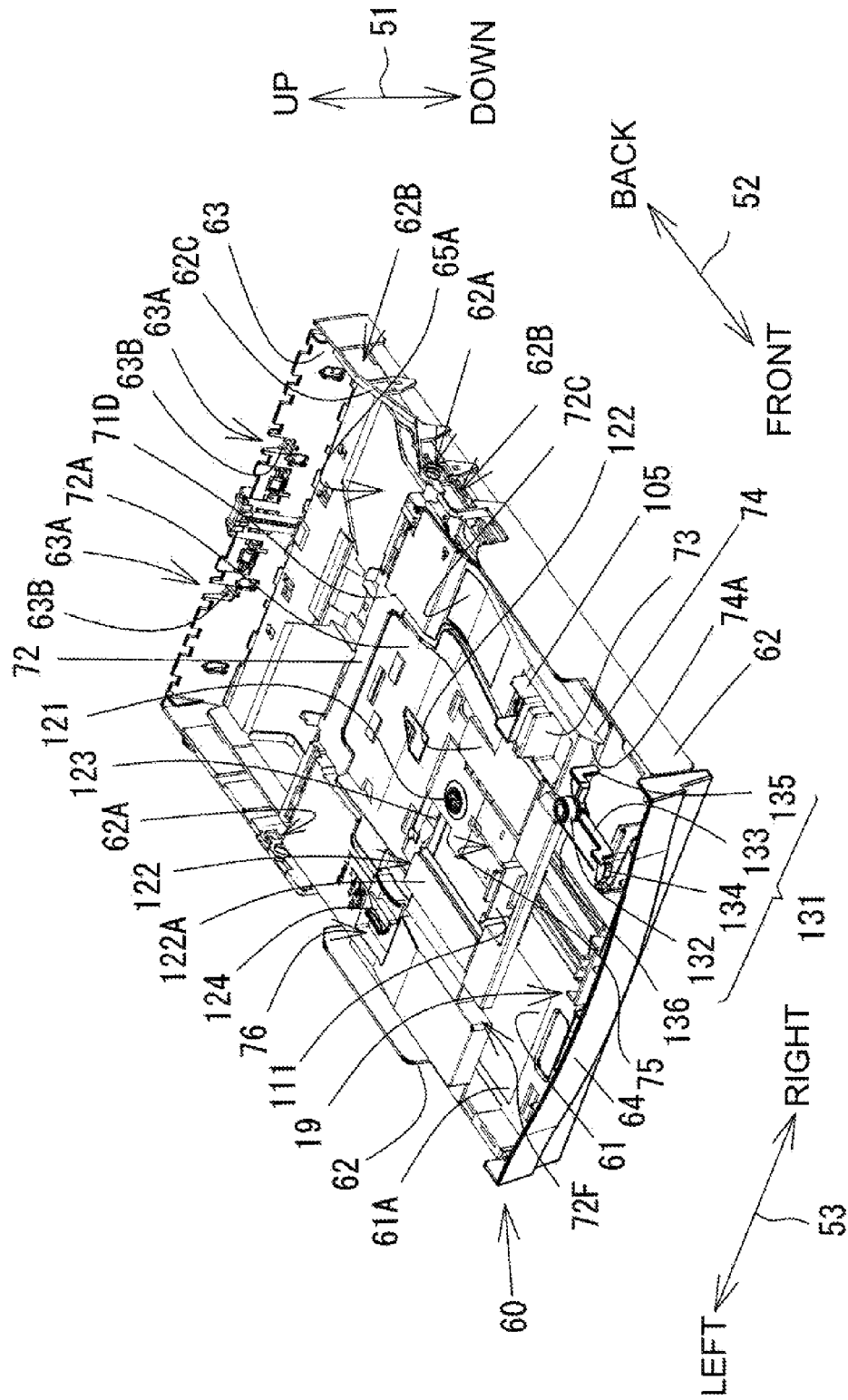


Fig.13



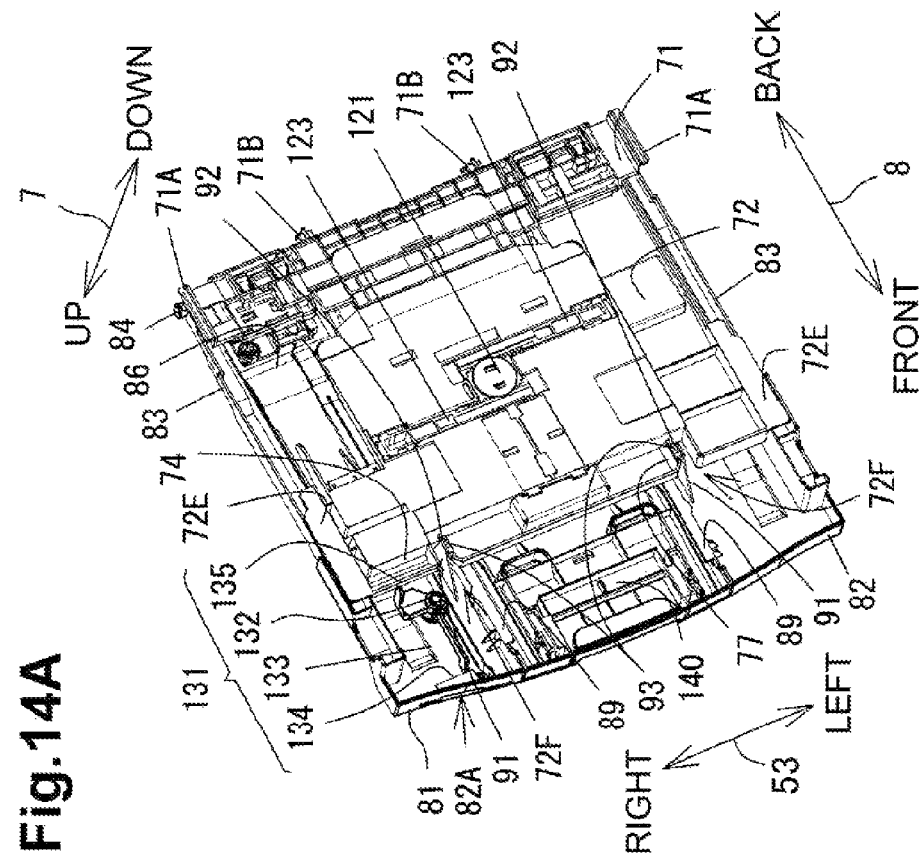
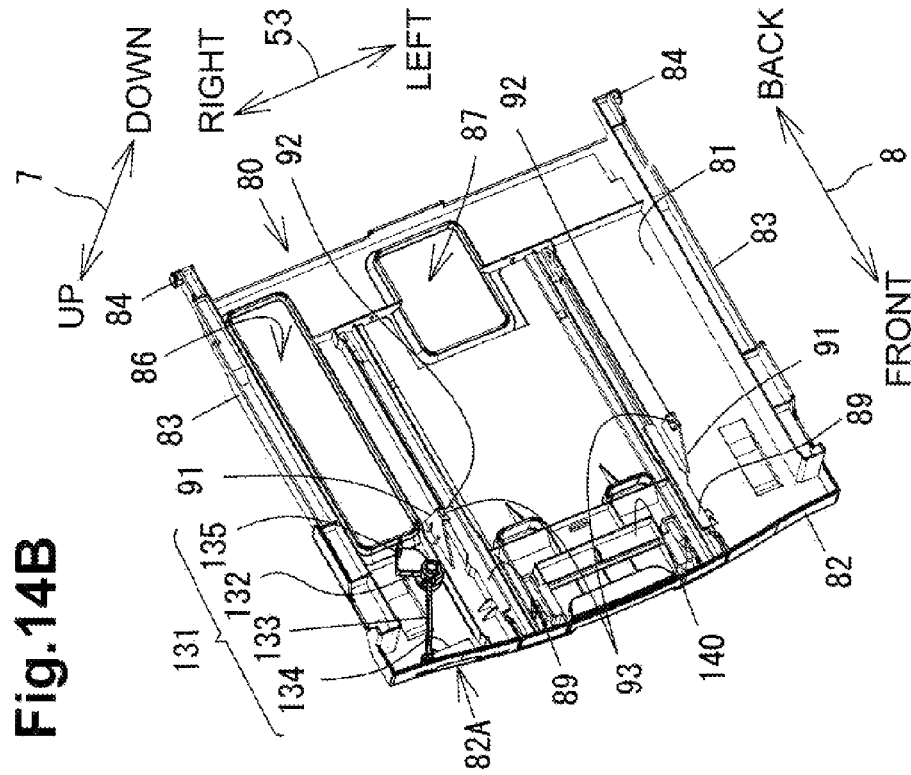
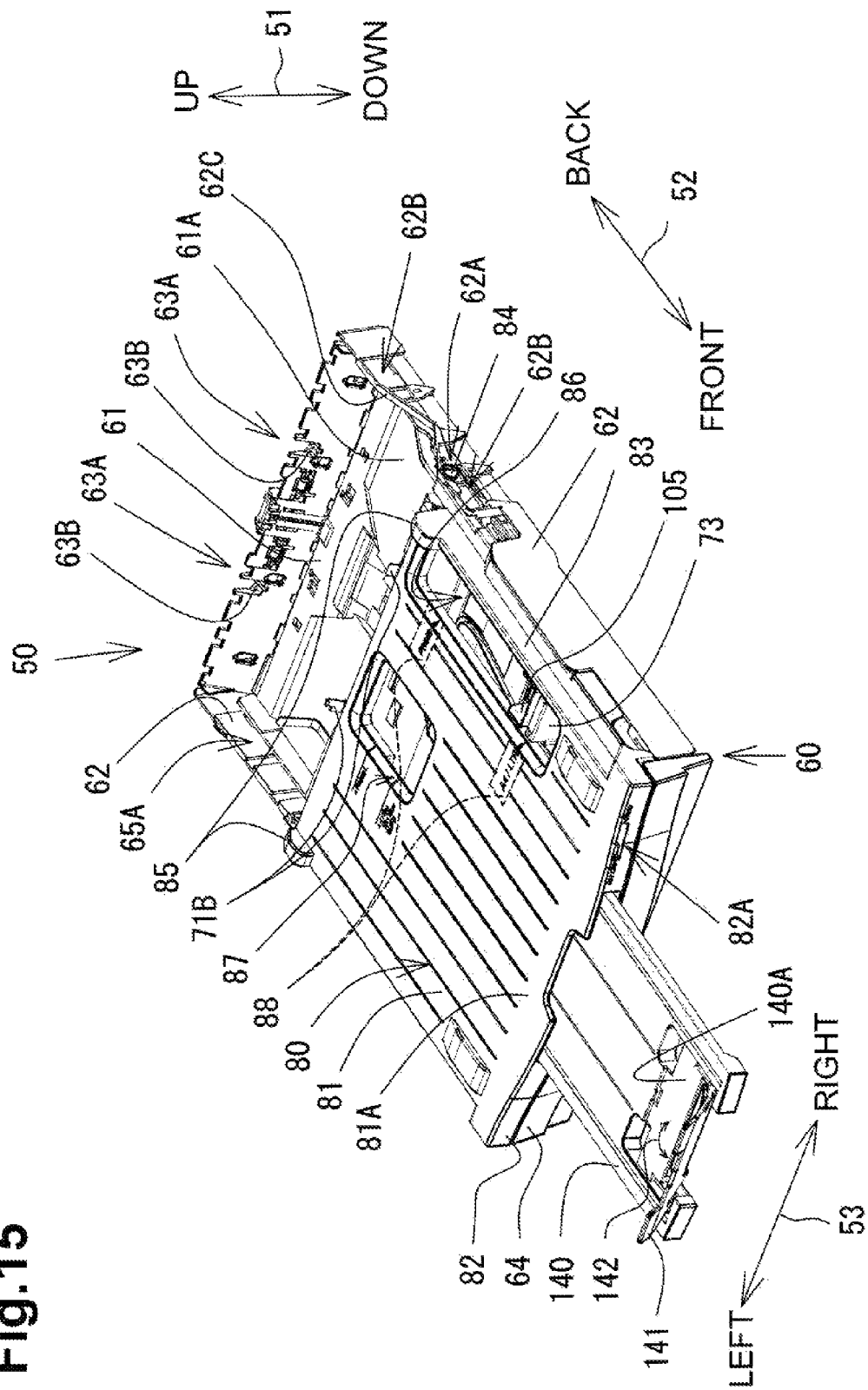


Fig.15



1

TRAY UNIT AND IMAGE RECORDING DEVICE

CROSS REFERENCE TO RELATED APPLICATION

The present application claims priority from Japanese Patent Application Publication No. JP-2010-223029, which was filed on Sep. 30, 2010, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a tray unit for storing recording media, e.g., sheets, and relates to an image recording device configured to convey a recording medium stored in a tray unit and to record an image on the recording medium.

2. Description of Related Art

A known image recording device comprises a tray unit comprising a main tray and a second tray each configured to hold thereon recording media. For example, A4 and B5 size recording sheets are placed on the main tray, and postcards are placed on the second tray. The second tray is disposed above the main tray and is configured to slide above the main tray between a position allowing a feed roller to contact the second tray and a position separated from the feed roller. The feed roller selectively feeds the sheets from the main tray and the second tray depending on the position of the second tray.

SUMMARY OF THE INVENTION

It may be beneficial to enhance the usability of a plurality of trays for use in an image recording device.

According to an embodiment of the invention, a tray unit comprises a first tray comprising a first holding surface for holding thereon a first sheet, a second tray comprising a second holding surface for holding thereon a second sheet, and a cover. The second tray is configured to slide above and along the first holding surface between a first second-tray position and a second second-tray position, and is configured to pivot between the second second-tray position and a third second-tray position in which the second tray stands upward with respect to the first holding surface. The cover is configured to cover from above at least a part of the second tray when the second tray is in the second second-tray position, and is configured to pivot between a first cover position in which the cover extends along the first holding surface and a second cover position in which the cover stands upward with respect to the first holding surface.

According to another embodiment of the invention, an image recording device comprises a first tray comprising a first holding surface for holding thereon a first sheet, a second tray comprising a second holding surface for holding thereon a second sheet, a cover, a feeder, a recording unit, and a discharging unit. The second tray is configured to slide above and along the first holding surface between a first second-tray position and a second second-tray position, and is configured to pivot between the second second-tray position and a third second-tray position in which the second tray stands upward with respect to the first holding surface. The cover is configured to cover from above at least a part of the second tray when the second tray is in the second position, and is configured to pivot between a first cover position in which the cover extends along the first holding surface and a second cover position in which the cover stands upward with respect to the first holding surface. The feeder is configured to feed the first

2

sheet when the second tray is in the second second-tray position and to feed the second sheet when the second tray is in the first second-tray position. The recording unit is configured to record an image on the sheet fed by the feeder. The discharging unit is disposed above the cover and is configured to discharge the sheet after the recording unit records the image on the sheet.

Other objects, features, and advantages will be apparent to persons of ordinary skill in the art from the following detailed description of the invention and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention, the needs satisfied thereby, and the features and technical advantages thereof, reference now is made to the following descriptions taken in connection with the accompanying drawings.

FIG. 1 is a perspective view of a main unit of an image recording device according to an embodiment of the invention.

FIG. 2 is a schematic cross-sectional view of a printer of the image recording device.

FIGS. 3A-3C are side views of a tray unit and a convey path forming member and show positional relations when the tray unit is mounted into a printer housing.

FIG. 4 is a perspective view of a main tray.

FIG. 5 is a perspective view of the main tray from an angle different from that of FIG. 4.

FIG. 6 is a perspective view of the tray unit when a second tray is in a feeding position and a discharge tray is in a receiving position.

FIG. 7 is a perspective view of the tray unit when the second tray is in a retracted position and the discharge tray is in the receiving position.

FIG. 8 is a perspective view of the tray unit when the second tray is in an open position and the discharge tray is in a loading position.

FIG. 9 is a perspective view of the tray unit when the second tray is in the feeding position and the discharge tray is in the loading position.

FIG. 10 is an exploded perspective view of the second tray.

FIG. 11 is a perspective view showing a state in which a sliding portion of the second tray is supported by the main tray.

FIG. 12 is a perspective view of the tray unit from which the discharge tray is removed and in which the second tray is in the feeding position.

FIG. 13 is a perspective view of the tray unit from which the discharge tray is removed and in which the second tray is in the retracted position.

FIG. 14A is a perspective bottom view of the discharge tray, showing a surface opposite to a discharge sheet holding surface.

FIG. 14B is a perspective bottom view of the second tray located in the retracted position and overlapping with the discharged tray.

FIG. 15 is a perspective bottom view of the tray unit in which an auxiliary tray is extended.

DETAILED DESCRIPTION OF EMBODIMENTS

Embodiments of the invention and their features and technical advantages may be understood by referring to FIGS. 1-15, like numerals being used for like corresponding parts in the various drawings.

An embodiment of the present invention will be described with reference to the drawings. In the present embodiment, an

3

image recording device **10** comprises a main unit **11** shown in FIG. **1** and a tray unit **50** shown in FIG. **4** that is mounted into the main unit **11**. As shown in FIG. **1**, the main unit **11** of the image recording device **10** has a substantially rectangular parallelepiped external shape. In the following description, the height direction of the main unit **11** of the image recording device **10** is defined as an up-down direction **7**, the depth direction thereof is defined as a front-back direction **8**, and the width direction thereof is defined as a left-right direction **9**. The tray unit **50** will be described as being mounted into the main unit **11** of the image recording device **10**.

A general structure of the main unit **11** of the image recording device **10** will be described. The main unit **11** comprises a printer housing **12**, a scanner housing **13** mounted on the top surface of the printer housing **12**, and a document cover **14** mounted on the top surface of the scanner housing **13**. The image recording device **10** is a multifunction device having a printing function, a scanning function, and a copying function.

An opening **12A** through which the tray unit **50** (see FIG. **6**) is inserted or extracted is formed at a lower front of the printer housing **12**. The printer housing **12** comprises guiderails (not shown) that support the tray unit **50** such that the tray unit **50** is slidable in the front-back direction **8**. The tray unit **50** may be supported by the printer housing **12** such that the tray unit **50** is detachable from the printer housing **12**, or such that the tray unit **50** is slidable over the sliding range. A printer **15** (see FIG. **2**), which will be described below, is housed in an upper area of the printer housing **12**. The printer **15** records images on recording media, e.g., sheets **54**. The sheets **54** are, for example, recording sheets, glossy sheets, or postcards.

The scanner housing **13** supports the document cover **14** such that the document cover **14** is openable and closable. A document sheet (not shown) can be placed on the scanner housing **13**, and be retained by being sandwiched between the scanner housing **13** and the document cover **14**. An image on the retained document sheet is scanned by a flatbed scanner that is housed in the scanner housing **13**, and is captured as image data. The scanner and the printer **15** are controlled by a control circuit (not shown). The control circuit receives information from a plurality of input buttons **16** shown in FIG. **1** or an external device, such as a personal computer, and controls the operations of the scanner and the printer **15** on the basis of the received information. Thus, an image capturing operation and an image recording operation are performed.

As shown in FIG. **2**, the printer **15** comprises a feeder **20** that feeds the sheets **54** stored in the tray unit **50** from the tray unit **50**; a sheet conveyor **30** that conveys the sheets **54** fed by the feeder **20**; a recording unit **40** that records images on the sheets **54** conveyed by the sheet conveyor **30**; and a drive unit (not shown) that drives the recording unit **40**, the sheet conveyor **30**, and the scanner. The drive unit comprises a plurality of motors and a driving force transmitting mechanism that transmits the driving force of the motors to the sheet conveyor **30**, the scanner, and other components. The motors are controlled by the above-described control circuit.

The feeder **20** comprises a shaft **21** that is rotatably supported by, for example, a frame fixed to the printer housing **12**; an arm **22** supported by the shaft **21**; and left and right feed rollers **23** supported by the arm **22**.

The arm **22** is pivotably supported, at one end thereof, by the shaft **21**. The other end of the arm **22** moves vertically as the arm **22** pivots about the shaft **21**. Thus, the feed rollers **23** are vertically movable. When the tray unit **50** is mounted into the printer housing **12** (see FIG. **1**), the arm **22** makes slide contact with a first contact surface **62C** (described below) provided on the right side wall **62** of a main tray **60** or a second

4

contact surface **72C** (see FIG. **6**) provided on a second tray **70** in the tray unit **50**. Accordingly, the arm **22** pivots such that the feed rollers **23** come into contact with a top surface of first sheets **54A** or a top surface of second sheets **54B** (see FIG. **2**) that are stored in the tray unit **50**.

The rotation of the shaft **21** is transmitted to feed rollers **23** through a plurality of transmission gears (not shown) attached to the arm **22**, and the feed rollers **23** are rotated accordingly. A control circuit controls a motor to rotate the feed rollers **23** such that the sheets **54** (see FIG. **2**) are fed backward. Each of the sheets **54** that have been fed backward is conveyed by the sheet conveyor **30**, which will be described below.

As shown in FIG. **2**, the sheet conveyor **30** comprises a convey path **31** and four pairs of convey rollers **32-35**. The convey path **31** is formed by a main convey path **31A** and a return path **31B**. The four pairs of convey rollers **32-35** are a pair of convey rollers **32**, a pair of discharge rollers **33**, a pair of switchback rollers **34**, and a pair of return rollers **35**.

The main convey path **31A** is defined by a plurality of guide members **36** and a platen **37**. The main convey path **31** curves upward from the back end of the tray unit **50** and then extends linearly forward. The platen **37** is positioned above the tray unit **50**, and defines a part of a linearly extending portion of the main convey path **31**.

The return path **31B** is defined by a guide member **38** and a guide member **39** (see FIG. **3**). The return path **31B** passes between the platen **37** and the tray unit **50**, and each end of the return path **31B** merges with the main convey path **31A** at a front portion and a back portion of the platen **37**.

The guide member **39** is supported by the above-described frame or the like and is pivotable about a shaft **39A** shown in FIG. **3**. The guide member **39** pivots between a guide position (see FIG. **3C**) in which the guide member **39A** defines the return path **31B** and guides a sheet, and an open position (see FIG. **3A**) in which the guide member **39** opens the return path **31B** for maintenance purposes.

The guide member **39** is held in the convey path forming position by projections **85** (described below) of the tray unit **50**. When a paper jam occurs in the return path **31B**, the tray unit **50** is withdrawn by a user from the printer housing **12**. The guide member **39**, which is not held by the tray unit **50** any more, pivots by its own weight from the guide position (see FIG. **3C**) to the open position (see FIG. **3A**). This allows the user to remove the jammed sheet **54**. Paper jam elimination can be carried out simply by withdrawing the tray unit **50**. When the tray unit **50** is mounted back to the printer housing **12**, the projections **85** of the tray unit **50** push the guide member **39** from the open position to the guide position, as shown in FIGS. **3A-3C**. The return path is defined by mounting the tray unit **50**. The projections **85** are each an example of a contact portion.

As shown in FIG. **2**, the convey rollers **32** comprise a driving roller **32A** that is rotated by the above-described drive unit and a driven roller **32B** that is rotated by the rotation of the driving roller **32A**. The discharge rollers **33** comprise a drive roller **33A** that is rotated by the above-described drive unit and a driven roller **33B** that is rotated by the rotation of the drive roller **33A**. The convey rollers **32** are disposed behind the platen **37**. The discharge rollers **33** are disposed in front of the platen **37** in the front-back direction **8**. The driving roller **32A** of the convey rollers **32** and the driving roller **33A** of the discharge rollers **33** are controlled to rotate by the above-described control circuit in a direction for conveying the sheet **54** forward. The sheet **54** is conveyed along the platen **37** by at least one of the pair of convey rollers **32** and the pair of discharge rollers **33**.

5

The switchback rollers **34** comprise a driving roller **34A** rotated by the above-described drive unit and a driven roller **34B** rotated by the rotation of the driving roller **34A**. The switchback rollers **34** are disposed in front of the discharge rollers **32** and above a central part of the tray unit **50** in the front-back direction **8**. The switchback roller **34A** is controlled by the above-described control circuit to rotate in one direction to discharge the sheet **54** and in the other direction to convey the sheet **54** to the return path **31B**. The switchback rollers **34** are an example of a discharging unit.

The return rollers **35** comprise a driving roller **35A** rotated by the above-described drive unit and a driven roller **35B** rotated by the rotation of the driving roller **35A**. The return rollers **35** convey the sheet **54** to the upstream side of the platen **37** in the main convey path **31A**. The sheet **54** conveyed by the return rollers **35** is flipped over and passes again the platen **37**.

The recording unit **40** comprises a carriage **41** disposed above the platen **37** and a head **42** retained by the carriage **41**. The carriage **41** is supported by guiderails (not shown) such that the carriage **41** is movable in the left-right direction **9**. The recording unit **40** ejects ink from the head **42** toward the sheet **54** that is conveyed along the platen **37**. Owing to the movement of the recording unit **40** in the left-right direction **9** and the forward movement of the sheet **54**, the recording unit **40** is capable of recording an image over substantially the entire area of the sheet **54**. Instead of using the recording unit **40** that records an image with ink, a recording unit that records an image with toner may be used.

The control circuit controls the above-described motors to move the recording unit **40**. The sheet **54** is intermittently conveyed on the platen, and the recording unit **40** ejects ink onto the sheet **54** being stopped. The control circuit controls the drive unit such that the switchback rollers **34** discharge the sheet **54** when single-sided printing is instructed and that the switchback rollers **34** convey the sheet **54** to the return path **31B** when double-sided printing is instructed. Under the control by the control circuit, the return rollers **35** convey the sheet **54** to the platen while the sheet **54** is flipped over, the recording unit **40** records an image on a back side of the sheet **54**, and the switchback rollers discharge the sheet **54** having images on both sides. The tray unit **50** receives the discharged sheet **54**.

As shown in FIG. 6, the tray unit **50** has a flattened rectangular parallelepiped external shape, and comprises the main tray **60**, the second tray **70** positioned above the main tray **60**, and a discharge tray **80** positioned above the second tray **70**. In the following description, the thickness direction of the tray unit **50** is defined as an up-down direction **51** of the tray unit **50**, the depth direction of the tray unit **50** is defined as a front-back direction **52** of the tray unit **50**, and the width direction of the tray unit **50** is defined as a left-right direction **53** of the tray unit **50**. When the tray unit **50** is mounted into the printer housing **12**, the up-down direction **7**, the front-back direction **8**, and the left-right direction **9** of the main unit **11** of the ink recording device **10** are aligned with the up-down direction **51**, the front-back direction **52**, and the left-right direction **53** of the tray unit **50**, respectively. The main tray **60** is an example of a first tray. The discharge tray **80** is an example of a cover and a discharged sheet receiver.

As shown in FIGS. 4 and 5, the main tray **60** has the shape of a box that is open at the top, and comprises a rectangular plate-shaped bottom **61** on which the first sheets **54A** (see FIG. 2) can be placed, left and right side walls **62**, a back wall **63**, and a front wall **64**. The first sheets **54A** (see FIG. 2) are

6

placed on an inner bottom surface **61A** of the main tray **60**. The inner bottom surface **61A** is an example of a first holding surface.

The back wall **63** is inclined with respect to the bottom **61** such that the back wall **63** extends obliquely upward and backward from a back end portion of the bottom **61**. Each of the first sheets **54A** and the second sheets **54B** fed by the above-described feeder **20** (see FIG. 2) is conveyed obliquely upward and backward by sliding along an inner surface of the back wall **63**. Thus, the back wall **63** has a function of guiding each sheet **54** to the convey path **31** (see FIG. 2).

As shown in FIG. 6, the back wall **63** has left and right notches **63A**. Fitting pieces **71B**, which will be described below, formed on the second tray **70** are fitted to the notches **63A**. The notches **63A** are formed into a substantially rectangular shape by cutting out the top edge of the back wall **63**. The notches **63A** have a function to position the second tray **70** in the left-right direction **53**, as will be described below.

The back wall **63** comprises engaging portions **63B** in the notches **63A**. The engaging portions **63B** engage with engaged portion (not shown) of the fitting pieces **71B** of the second tray **70**, thereby to hold the second tray **70** in the feeding position.

The left and right side walls **62** comprise guiderails **66** for supporting the second tray **70** and shaft holes **62A** for supporting the discharge tray **80**. A front portion of each guiderail **66** in the front-back direction **52** is provided on the inner surface of the side wall **62** so as to support the second tray **70** at the top surface of the guiderail **66**. A back portion of each guiderail **66** is formed in the side wall **62** as a groove extending in the front-back direction **52** so as to support the second tray **70** in the groove. The guiderails **66** support the second tray **70** such that the second tray **70** is slidable in the front-back direction **52**. The shaft holes **62A** are formed through the side walls **62**, and projecting shafts **84** of the discharge tray **80**, which will be described below, are inserted through the shaft holes **62A**, respectively. Each shaft hole **62A** is provided between a central part and the back end of the corresponding side wall **62** in the front-back direction **52**.

Front and back lock holes **62B** are formed in the right side wall **62**. As described below, the lock holes **62B** have a function of fixing a sliding portion **71** of the second tray **70**.

The right side wall **62** has, as a part of the top surface thereof, the first contact surface **62C** whose height decreases toward the front. When the tray unit **50** is withdrawn from the printer housing **12** while the second tray **70** is in a retracted position which will be described below, the arm **22** (see FIG. 2) makes slide contact with the first contact surface **62C** such that the feed roller **23** moves up. When the tray unit **50** is mounted into the printer housing **12** while the second tray **70** is in the retracted position, the arm **22** makes slide contact with the first contact surface **62C** such that the feed roller **23** moves down and contact the first sheet **54A**.

A side guide mechanism **18** and a rear guide mechanism **19** are provided on the bottom **61** of the main tray **60** to properly position the first sheets **54A** (see FIG. 2) on the bottom **61** of the main tray **60**. The structures of the side guide mechanism **18** and the rear guide mechanism **19** are similar to those of a side guide mechanism **122** and a rear guide mechanism **110** (see FIG. 10) provided on the second tray **70**, and explanations thereof are thus omitted here.

As shown in FIG. 10, the second tray **70** comprises a rectangular plate-shaped sliding portion **71** that extends in the left-right direction **53** and a rectangular plate-shaped pivoting portion **72**. The second sheets **54B** are placed on a second holding surface **72A**, which is the top surface of the pivoting portion **72**, and a second holding surface **71D**, which is the top

7

surface of the sliding portion 72. The second holding surface 72A is an example of a second holding surface. The first sheets 54A and the second sheets 54B may either be different types of sheets or the same type of sheets.

As shown in FIG. 10, first flanges 71A project from the left and right ends of the sliding portion 71. The first flanges 71A are supported by the above-described guiderails 66 (see FIG. 6) provided on the main tray 60. The first flanges 71A slide along the groove-shaped portions of the guiderails 66 provided at the side walls 62. Accordingly, the sliding portion 71 moves in the front-back direction 52. Thus, the sliding portion 71 is supported by the main tray 60 such that the sliding portion 71 is slidable in the front-back direction 52.

The left and right fitting pieces 71B are provided at the back end of the sliding portion 71. The fitting pieces 71B project upward and backward from the back end of the sliding portion 71. When the second tray 70 is in the feeding position, the fitting pieces 71B are fitted to the notches 63A (see FIG. 4) formed in the back wall 63 of the main tray 60. As a result, the second tray 70, when in the feeding position, is properly positioned in the left-right position 53. First support portions 71C are provided on left and right parts of the sliding portion 71 to pivotally support the pivoting portion 72.

A locking mechanism 100 is provided on the right part of the sliding portion 71. The locking mechanism 100 comprises a lock member 101, a retaining portion 102, a first spring 71E, a connecting bar 103, a second support portion 104, a release lever 105, and a transmission mechanism (not shown). The lock member 101 is supported by the retaining portion 102 such that the lock member 101 is movable in the left-right direction 53. The first spring 71E urges the lock member 101 rightward. The second support portion 104 supports an end of the connecting bar 103 such that the connecting bar 103 is pivotable and is movable in the front-back direction 52. The connecting bar 103 pivots between a position to project forward from the sliding portion 71 and a position to project upward from the sliding portion 71. The connecting bar 103 moves in the front-back direction 52 when the connecting bar 103 is in the position to project forward from the sliding portion 71. The release lever 105 projects upward from a front end of the connecting bar 103 when the connecting bar 103 is in the position to project forward from the sliding portion 71.

When the release lever 105 is moved forward in FIG. 10 by a user, the transmission mechanism moves, in response to a movement of the connecting bar 103, the lock member 101 leftward against the urging force applied by the first spring 71E. Thus, the lock member 101 is moved from a projecting position shown in FIG. 10 to a retracted position.

As shown in FIG. 11, the lock member 101 which is in the projecting position is fitted into the one of the lock holes 62B to thereby disable the sliding portion 71 to slide in the front-rear direction. Thus, the sliding portion 71 is fixed to the main tray 60. The second tray 70 slides between a front position and a back position. When the second tray 70 is in the front position, the lock member 101 is fitted into the front lock hole 62B. When the second tray 70 is in the back position, the lock member 101 is fitted into the back lock hole 62B. The lock holes 62B are an example of first positioning members, and the lock member 101 is an example of a second positioning member.

Left and right second flanges 72E project from the left and right sides of the pivoting portion 72, which is rectangular plate-shaped. The second flanges 72E and the above-described first flanges 71A are supported on the top surfaces of the guiderails 66 (see FIG. 11) of the main tray 60. Thus, both the pivoting portion 72 and the sliding portion 71 are slidably supported by the main tray 60.

8

The pivoting portion 72 is supported on the first support portions 71C of the sliding portion 71 in a pivotable manner. The pivot axis of the pivoting portion 72 coincides, in position, with the pivot axis of the connecting bar 103 and moves as the sliding portion 72 slides. When the sliding portion 71 is in the front position, the pivot axis of the pivoting portion 72 substantially coincides, in position, with the pivot axis of the discharge tray 80. As will be described below, the discharge tray 80 is supported by the main tray 60 at the shaft holes 62A in a pivotable manner. It is not necessary that the pivot axis of the pivoting portion 72 and the pivot axis of the discharge tray 80 precisely coincide, in position, with each other as long as the pivoting portion 72 and the discharge tray 80 are pivotable. However, it is preferable that the pivot axis of the pivoting portion 72 substantially coincides, in position, with the pivot axis of the discharge tray 80 in order for the pivoting portion 72 and the discharge tray 80 to pivot integrally. In this case, the pivoting portion 72 and the discharge tray 80 pivot smoothly while positional displacement with relative to each other is prevented. The pivoting portion 72 pivots between a lying position in which the second holding surface 72A faces upward and extends along the inner bottom surface 61A (first holding surface) of the main tray 60, and a standing position in which the second holding surface 72A stands upward with respect to the inner bottom surface 61A.

In the following description, the second tray 70 is described as being in a feeding position when the sliding portion 71 is in the above-described back position and the pivoting portion 72 is in the above-described lying position, as shown in FIG. 12. The second tray 70 is described as being in a retracted position when the sliding portion 71 is in the above-described front position and the pivoting portion 72 is in the lying position, as shown in FIG. 13. The second tray 70 is described as being in an open position when the sliding portion 71 is in the front position and the pivoting portion 72 is in the standing position, as shown in FIG. 8. The feeding position is an example of a first second-tray position, the retracted position is an example of a second second-tray position, and the open position is an example of a third second-tray position. As shown in FIG. 6, the pivoting portion 72, when in the feeding position, is located at a feeding port 65A (see FIG. 7) which is a back part of the opening 65 of the main tray 60. As shown in FIG. 13, the pivoting portion 72, when in the retracted position, is at a loading port 65B (see FIG. 12) and closes the loading port 65A which is a front part of the opening 65. As shown in FIG. 8, the pivoting portion 72, when in the open position, opens the loading port 65B. In the following description, the pivoting portion 72 is described as being in the lying position unless otherwise specified. When the second tray 70 is in the feeding position, the second holding surface 72A faces the feed rollers 23 of the feeder 20. Accordingly, the second sheets 54B placed on the second holding surface 72A are fed toward the recording unit 40. When the second tray 70 is in the retracted position, the inner bottom surface 61A (first holding surface) of the main tray 60 faces the feed rollers 23. Accordingly, the first sheets 54A placed on the inner bottom surface 61A are fed toward the recording unit 40.

As shown in FIG. 10, the pivoting portion 72 has, in the right part thereof, an insertion hole 72B into which the release lever 105 is inserted from below. An operation lever 73 projects upward from the top surface of a peripheral wall around the insertion hole 72B at the front side thereof. The operation lever 73 faces, in the front-back direction 52, the release lever 105 that is inserted into the insertion hole 72B from below. The user pulls the release lever 105 toward the operation lever 73 by the fingers, so that the lock member 101

is released from the lock hole 62B. Then, the user moves the operation lever 73 and the release lever 105 in the front-back direction 52, thereby sliding the second tray 70. By releasing the release lever 105 when the sliding portion 71 reaches the front position or the back position, the lock member 101, which is urged by the first spring 71E, is fitted into the front lock hole 62B or the back lock hole 62B. The user recognizes that the sliding portion 71 has reached the front position or the back position from a tactile sensation or a sound generated when the lock member 101 is fitted into one of the lock holes 62B. Thus, the second tray 70 is prevented from being left in an intermediate position.

The pivoting portion 72 comprises a support cover 72D (see FIG. 8) disposed below the connecting bar 103. The support cover 72D supports the release lever 105 such that the release lever 105 pivots integrally with the pivoting portion 72 and moves in the front-back direction relative to the pivoting portion 72.

The pivoting portion 72 has the second contact surface 72C as a part of the top surface thereof. The second contact surface 72C is provided on the right part of the pivoting portion 72, and is inclined such that the height thereof decreases toward the front. When the tray unit 50 is mounted into the printer housing 12 (see FIG. 1) while the second tray 70 is in the above-described feeding position, the above-described arm 22 (see FIG. 3) makes slide contact with the second contact surface 72C such that the feed rollers 23 are lowered and come into contact, from above, with a top surface of the second sheets 54B (see FIG. 2) placed on the pivoting portion 72. The height of the pivoting portion 72 is set such that the second holding surface 72A of the pivoting portion 72, when in the lying position, is below the upper end of the back wall 63 of the main tray 60. Accordingly, similarly to the first sheets 54A, the second sheets 54B on the second holding surface 72A are guided by the back wall 63 to the main convey path 31A. The sheets 54 subjected to image recording are switched by sliding the second tray 70 by the user.

As will be described below, an indicating mechanism 130 provided on the discharge tray 80 indicates whether the second tray 70 is in the feeding position or the retracted position, that is, whether the first sheets 54A or the second sheets 54B are subjected to image recording. A contact portion 74 for changing the indication by the indicator is provided in the right part of the front end of the pivoting portion 72. The contact portion 74 has an inclined surface 74A that descends frontward. The contact portion 74 is an example of a second-tray contact portion.

As shown in FIG. 8, the pivoting portion 72 has left and right cut portions 72F which are formed at a pivoting end of the pivoting portion 72. The pivoting portion 72 comprises left and right engagement ribs 77. The left engagement rib 77 partially defines the left cut portion 72F. The right engagement rib 77 partially defines the right cut portion 72F. Hook pieces 92, which will be described later, project toward a lower side of the pivoting portion 72, which is opposite to the second holding surface 72A, and engage with the engagement ribs 77. Each engagement rib 77 has an inclined surface 77A which tapers toward its tip and is inclined downward and in a direction away from the central part in the left-right direction 53. Each inclined surface 77 is inclined with respect to a pivoting direction of the discharge tray 80 (a circumferential direction around the pivot axis of the discharge tray 80) and is not perpendicular to the pivoting direction of the discharge tray 80. Because the engagement ribs 77 formed at the cut portions 72F allow the hook pieces 92 to be disposed behind the front end of the pivoting portion 72, the overall size of the

tray unit 50 can be reduced. The engagement ribs 77 are an example of an engaged portion.

As shown in FIG. 10, the pivoting portion 72 has a guiding long hole 75 and an operation recess 76 in a front area thereof. The guiding long hole 75 extends through the pivoting portion 72 and in the front-back direction 52. The guiding long hole 75 is provided in a central part of the pivoting portion 72 in the left-right direction 53. The operation recess 76 is provided on a left part of the pivoting portion 72 and adjacent to the second holding surface 72A. The functions of the guiding long hole 75 and the operation recess 76 will be described below, along with a description of the rear guide mechanism 110 and the side guide mechanism 120.

As shown in FIG. 10, the rear guide mechanism 110 comprises a rear guide 111 placed on the second holding surface 72A so as to extend over peripheral walls at the left and right sides of the above-described guiding long hole 75; a guide piece (not shown) that projects downward from the rear guide 111 so as to extend through the guiding long hole 75; and a retaining portion 112 (see FIG. 8) arranged such that the peripheral walls at the left and right sides of the guiding long hole 75 are placed between the rear guide 111 and the retaining portion 112 in the thickness direction of the pivoting portion 72. Thus, the rear guide 111 is supported by the pivoting portion 72 such that the rear guide 111 is movable along the front-back direction 52. The user holds and moves the rear guide 111 such that the second sheets placed on the second holding surface 72A are sandwiched by the rear guide 111 and the above-described fitting pieces 71B provided on the sliding portion 71. Thus, the second sheets 54B are properly positioned in the front-back direction 52.

The side guide mechanism 120 comprises a pinion gear 121 that is rotatably retained in a central part of the pivoting portion 72 in the left-right direction 53; left and right side guides 122 arranged at the left and right sides of the pinion gear 121; left and right rack gears 123, each of which is coupled to the corresponding side guide 122 at one end thereof and is meshed with the pinion gear 121 at the other end thereof; and a lug 124 that is connected to the left side guide 122 and disposed in the above-described operation recess 76.

Each of the side guides 122 comprises a holding plate (not shown) that forms a part of the second holding surface 72A; a side plate (not shown) that stands upward with respect to the holding plate; and a top plate 122A that is supported by the side plate so as to face the holding plate in a direction perpendicular to the second holding surface 72A (up-down direction 51 in FIG. 10). In the left side guide 122, the side plate is connected to the left edge of the holding plate. In the right side guide 122, the side plate is connected to the right edge of the holding plate.

The length of the lug 124 in the left-right direction 53 is smaller than the length of the operation recess 76 in the left-right direction 53, and the lug 124 is movable along the left-right direction 53. When the user moves the lug 124 rightward or leftward, the left side guide 122 and the left rack gear 123 are moved leftward or rightward. When the left rack gear 123 is moved, the pinion gear 121 is rotated. Accordingly, the right rack gear 123 that meshes with the pinion gear 121 and the right side guide 122 are moved leftward or rightward in response to the rotation of the pinion gear 121. Thus, the pair of side guides 122 are moved toward or away from each other in association with each other. The user moves the lug 124 such that the side plates of the left and right side guides 122 sandwich the second sheets 54B placed on the second holding surface 72A. Thus, the second sheets 54B are properly positioned in the left-right direction 53. The second

11

sheets 54B are properly positioned on the second holding surface 72A by the above-described rear guide mechanism 110, the fitting pieces 71B, and the side guide mechanism 120.

As shown in FIGS. 6 to 9, the discharge tray 80 comprises a rectangular plate-shaped base 81 that is capable of supporting the first sheets 54A and the second sheets 54B discharged by the switchback rollers 34, a front wall 82, left and right side walls 83, and left and right projecting shafts 84 that serve as a pivot shaft. The left and right projecting shafts 84 project from back end portions of the left and right side walls 83 in directions away from each other along the left-right direction 53. A discharged sheet holding surface 81A, which is an upper surface of the base 81, supports the discharged sheets 54. The discharge tray 80 is configured to cover at least a portion of the second tray 70 irrespective of whether the second tray 70 is in the feeding position or in the retracted position. Thus, the discharge tray 80 functions as a cover of the tray unit 50. The discharge tray 80 reduces the risk that dust will enter the main tray 60 or the second tray 70 and the risk that the sheets 54, the holding surfaces, etc., will be damaged when the tray unit 50 is transported alone or together with the image recording device 10.

The projecting shafts 84 are inserted into the above-described shaft holes 62A in the left and right side walls 62 of the main tray 60 from the inside of the side walls 62. Owing to the projecting shafts 84 and the shaft holes 62A, the discharge tray 80 is supported by the main tray 60 such that the discharge tray 80 is pivotable between a receiving position shown in FIGS. 6 and 7 and a loading position shown in FIGS. 8 and 9. When the discharge tray 80 is in the receiving position, a discharged sheet receiver, e.g., a discharged sheet holding surface 81A of the base 81 extends along the inner bottom surface 61A (first holding surface) of the main tray 60. When the discharge tray 80 is in the loading position, the discharged sheet holding surface 81A stands upward with respect to the inner bottom surface 61A of the main tray 60. The discharge tray 80 is an example of a cover and an example of a discharged sheet receiver. The receiving position is an example of a first cover position, and the loading position is an example of a second cover position. It is not necessary that the base 81 extend parallel to the inner bottom surface 61A of the main tray 60 when the base 81 is in the receiving position, as long as the base 81 extends substantially along the inner bottom surface 61A such that the discharged sheets 54 can be received by the base 81.

As described above, the pair of switchback rollers 54 that discharge the sheet 54 after an image is recorded thereon are disposed above a central part of the tray unit 50 in the front-back direction 8. In addition, each of the shaft holes 62A into which the projecting shafts 84 are inserted is provided between a central part and the back end of the corresponding side wall 62 of the main tray 60 in the front-back direction 52. Therefore, in the state in which the tray unit 50 is mounted in the printer housing 12, the back end of the base 81 of the discharge tray 80 in the receiving position is positioned below the switchback rollers 33, so that the discharge tray 80 can receive the sheet 54 having an image recorded thereon and discharged by the switchback rollers 33. The sheet 54 having the image recorded thereon is discharged by the discharge rollers 33 and slides, from a leading edge thereof in the discharging direction, that is, from a front edge thereof, along the discharge tray 80 in the receiving position or along the previously discharged sheet 54. Thus, the sheets 54 are stacked on the discharge tray 80.

The discharge tray 80 is provided with a holdable portion 80A at its pivoting end (front end in FIG. 6). The user holds

12

the holdable portion 80A by the fingers and lifts the front end of the discharge tray 80 so that the discharge tray 80 is moved from the above-described receiving position to the loading position. Then, the user supplies the first sheets 54A to the main tray 60 through a loading port 65B (see FIG. 8), which is a front part of the opening 65.

When the discharge tray 80 is in the receiving position, a lower end of the front wall 82 is in contact with a top end of the front wall 64 of the main tray 60. The discharge tray 80 is retained in the receiving position while the front wall 82 is supported by the front wall 64 of the main tray 60 and the projecting shafts 84 are supported by the side walls 62 of the main tray 60.

The projections 85 project from a back end portion of the discharged sheet holding surface 81A of the base 81 in FIG. 6. When the discharge tray 80 is opened while the second tray 70 is in the feeding position, the projections 85 come into contact with the pivoting portion 72 of the second tray 70. Thus, an opening angle α of the discharge tray 80 is determined by the projections 85. The projections 85 are disposed on the left and right sides of the discharge tray 80 so that the discharge tray 80 in the opened state does not come into contact with or damage the second sheets 54B placed on the second tray 70. The distance by which the projection 85 projects is set to a predetermined value. This value is determined such that the opening angle α of the discharge tray 80 is larger than 90 degrees (for example, 100 degrees), as shown in FIGS. 8 and 9. The projection 85 comes into contact with a receiving portion 7 (see FIG. 9) of the pivoting portion 72 of the second tray 70. Instead of the projections 85 provided on the discharge tray 80, the projections 85 may be provided on the pivoting portion 72 of the second tray 70. Alternatively, instead of the projections 85, stoppers that regulate the opening angle of the discharge tray 80 may be provided on the projecting shafts 84 of the discharge tray 80.

The projections 85 are positioned such that the projections 85 push the above-described guide member 39, which defines the return path 31B, when the tray unit 50 is mounted into the printer housing 12. Thus, the projections 85 have a function of limiting the opening angle α of the discharge tray 80 to protect the second sheets 54B and a function of changing the position of the guide member 39 to close the return path 31B. Although the projections 85 have the above-described two functions, separate components may be provided to achieve the above-described two functions.

The base 81 includes an opening, e.g., a first operation window 86 and a second operation window 87. The first operation window 86 extends through a right part of the base 81 in FIG. 6, and is formed as a rectangular hole that extends in the front-back direction 52 in FIG. 6. The above-described operation lever 73 and the release lever 105 are exposed to the outside of the tray unit 50 through the first operation window 86, over the entire sliding range of the second tray 70. The user slides the second tray 70 by operating the operation lever 73 and the release lever 105 through the first operation window 86. The operation lever 73 and the release lever 105 are arranged such that they do not project from the discharged sheet holding surface 81A. Therefore, the sheet 54 having an image recorded thereon and discharged by the switchback rollers 34 is prevented from being blocked by the operation lever 73 or the release lever 105 when the sheet 54 slides along the discharged sheet holding surface 81A.

Marks 88 are provided at an edge of the first operation window 86. Each mark 88 shows the information about the position of the second tray 70 or the information about the type of the sheets 54 subjected to image recording. The user recognizes the position of the second tray 70 or the type of the

13

sheets 54 subjected to image recording from the information shown by the marks 88 and the position of the operation lever 73 and the release lever 105.

The second operation window 87 extends through the back end portion of the base 81 and in the central part in the left-right direction 53 in FIG. 6 of the base 81. The above-described rear guide 111 can be exposed to the outside of the tray unit 50 through the second operation window 87 when the second tray 70 is in the feeding position. The second operation window 87 has a rectangular shape whose dimension in the front-back direction 52 is somewhat larger than the dimension thereof in the left-right direction 53, so that the user can easily operate the rear guide 111.

As shown in FIGS. 8 and 9, the discharge tray 80 comprises left and right connecting pieces 91 and left and right hook pieces 92. The connecting pieces 91 project from the lower surface of the base 81 at the side opposite to the discharged sheet holding surface 81A. The hook pieces 92 project toward each other (toward the central part in the left-right direction) from lower ends of the connecting pieces 91 and extend in the front-back direction 52 by a length larger than the length by which the hook pieces 92 project. Thus, the hook pieces 92 are connected to the base 81 via the connecting pieces 91. The connecting pieces 91 are disposed outside the space in which the second tray 70 is moved. The connecting pieces 91 are each an example of a connecting member. The hook pieces 92 are each an example of an engaging portion. The hook pieces 92 extend in the front-back direction 52. Thus, even if the pivoting portion 72 is slightly moved relative to the discharge tray 80 in the radial direction of its pivoting movement, the hook pieces 92 are prevented from being disengaged from the engagement ribs 77. Alternatively, the connecting pieces 91 and the hook pieces 92 may be configured such that the hook pieces 92 project backward from the connecting pieces disposed at the front side.

The connecting pieces 91 and the hook pieces 92 are disposed closer to the pivoting end of the base 81 than to the pivot axis of the base 81. The distance between the left and right connecting pieces 91 is slightly larger than the distance between the engagement ribs 77 of the pivoting portion 72. The distance from the base 81 to the hook pieces 92 is slightly larger than the thickness of the pivoting portion 72 of the second tray 70. As described below, when the second tray 70 is slid, the above-described engagement ribs 77 are inserted between the base 81 and the hook pieces 92. More specifically, in the state in which the discharge tray 80 is in the receiving position and the second tray 70 is in the retracted position, the hook pieces 92 are positioned below the second tray 70.

When the discharge tray 80 is in the receiving position and the second tray 70 is in the retracted position, the top surface of the second tray 70 is covered by the base 81, the left and right side faces of the second tray 70 are covered by the left and right side walls 83, and the front face of the second tray 70 is covered by the front wall 82. The discharge tray 80 prevents dust from entering the second tray 70 when the second tray 70 is in the retracted position. The left and right side walls 83 and the front wall 82 of the discharge tray 80 are each an example of a cover portion.

Each hook piece 92 has an inclined surface 93. The inclined surface 93 is inclined such that the hook piece 92 becomes thinner toward its projecting end. The hook pieces 92, the connecting pieces 91, and the base 81 are formed integrally with each other by using synthetic resin material, and the connecting pieces 91 are elastically deformable. As described below, when the discharge tray 80 is moved from the loading position to the receiving position, each engagement rib 77 of

14

the pivoting portion 72 slides along the corresponding inclined surface 93, thereby to smoothly bend the corresponding connecting piece 91. In the present embodiment, the inclined surface 77A is formed on the engagement rib 77 and the inclined surface 93 is formed on the hook piece 92. Alternatively, an inclined surface may be formed on only one of the engagement rib 77 and the hook piece 92. The inclined surface 93 is inclined with respect to a pivoting direction of the discharge tray 80 (a circumferential direction around the pivot axis of the discharge tray 80) and is not orthogonal to the pivoting direction.

An indication window 82A is formed in the front wall 82 of the discharge tray 80 such that an indicating portion 134 of an indicator 131 of the indicating mechanism 130, which will be described below, is exposed to the outside of the tray unit 50 through the indication window 80. In addition, as shown in FIG. 8, a shaft 81B projects from the lower surface of the base 81 at the side opposite to the discharge holding surface 81A. The shaft 81B supports the indicator 131 in a rotatable manner.

As shown in FIGS. 8 and 9, the indicating mechanism 130 includes the indicator 131 and a second spring 136 that urges the indicator 131. The indicator 131 includes a ring portion 132 into which the shaft 81B is inserted, a connecting piece 133 that projects toward the front wall 82 of the discharge tray 80 from the ring portion 132, the indicating portion 134 attached to an end of the connecting piece 133, and a receiving portion 135 that is formed integrally with the ring portion 132. The receiving portion 135 is an example of indicator contact portion. The second spring 136 is an example of an urging member.

When the second tray 70 is moved from the feeding position to the retracted position, the contact portion 74 on the pivoting portion 72 of the second tray 70 comes into contact with the receiving portion 135, so that the receiving portion 135 is pushed toward the front wall 82 of the discharge tray 80. When the receiving portion 135 is pushed by the second tray 70, the indicator 131 rotates around the shaft 81B so as to move from a first indicator position to a second indicator position. The second spring 136 urges the indicator 131 to move from the second indicator position to the first indicator position. Therefore, when the second tray 70 is moved from the retracted position to the feeding position, the indicator 131 moves from the second indicator position to the first indicator position by the urging force of the second spring 136.

The sliding portion 71 of the second tray 70 is locked at the front position by the above-described lock member 101. Therefore, the sliding portion 71 can be prevented from being pushed toward the back position by the indicator 131 that is urged by the second spring 136. The pivoting portion 72 has an inclined surface 74A which continues from the contact portion 74 and tapers toward the contact portion 74. When the discharge tray 80 is moved from the receiving position to the loading position while the second tray 70 is in a position other than the retracted position, the indicator 131 is in the first indicating position owing to the urging force applied by the second spring 136. Then, when the second tray 70 is moved to the retracted position and the discharge tray 80 is returned to the receiving position, the inclined surface 74A comes into contact with the receiving portion 135, so that the discharge tray 80 can be smoothly pivoted. Accordingly, the indicator 131 is moved to the second display position.

When the indicator 131 is rotated around the shaft 81B, the positions of a first indicating surface (not shown) and a second indicating surface (not shown) of the indicating portion 134 are changed. The first indicating surface shows informa-

15

tion indicating that the second tray 70 is in the feeding position and the second sheets 54B are subjected to image recording. The second indicating surface shows information indicating that the second tray 70 is in the retracted position and the first sheets 54A are subjected to image recording.

The first indicating surface, whose position changes in response to the movement of the second tray 70, is exposed through the indication window 82A when the second tray 70 is in the feeding position (that is, when the indicator 131 is in the first indicating position), and is covered by the front wall 82 of the discharge tray 80 when the second tray 70 is in the retracted position (that is, when the indicator 131 is in the second indicating position). The second indicating surface is exposed through the display window 82A when the second tray 70 is in the retracted position, and is covered by the front wall 82 of the discharge tray 80 when the second tray 70 is in the feeding position. In the state in which the tray unit 50 is mounted in the printer housing 12, the user can recognize whether the first sheets 54A or the second sheets 54B are subjected to image recording from the information shown in the indicating surface that is visible through the indication window 82A.

In the present embodiment, the indication is switched by changing the positions of the first indicating surface and the second indicating surface, thereby to change the indicating surface that is visible through the display window 82A. Alternatively, the indication may be switched by changing the orientations of the first indicating surface and the second indicating surface. More specifically, both the first indicating surface and the second indicating surface may be exposed through the indication window 82A, and the orientations of the first indicating surface and the second indicating surface at the time when the second tray 70 is in the feeding position may be changed from those when the second tray 70 is in the retracted position. The user can recognize whether the first sheets 54A or the second sheets 54B are subjected to image recording from the information shown on the indicating surface that is oriented along the opening surface of the indication window 82A.

In addition, in the present embodiment, the indicating mechanism 130 switches the indication by changing the position of the indicator 131 in response to the sliding movement of the second tray 70. Alternatively, an indicating mechanism may be used which comprises a power source, a display unit, such as a light-emitting diode (LED), that is turned on when electric power is supplied from the power source, and a sensor, such as a tactile switch, that can be turned on or off in response to the sliding movement of the second tray 70. In such a case, the tactile switch is turned on or off in response to the sliding movement of the second tray 70, so that the LED is turned on or off accordingly. Thus, the indication is switched between the on state and the off state of the LED.

As shown in FIGS. 14A and 14B, the discharge tray 80 comprises left and right support ribs 89 that support an auxiliary tray 140 in a slidable manner. The support ribs 89 project from the lower surface of the base 81 at the side opposite to the discharged sheet holding surface 81A, and extend in the front-back direction 52 when the discharge tray 80 is in the receiving position. The support ribs 89 support left and right edges of the auxiliary tray 140, which has a rectangular shape, such that the auxiliary tray 140 is slidable in the front-back direction 52. The auxiliary tray 140 is an example of a third tray.

The auxiliary tray 140 slides between a position stored in the discharge tray 80 shown in FIGS. 14A and 14B and a receiving position shown in FIG. 15. The auxiliary tray 140 receives, in cooperation with the discharge tray 80, the sheet

16

54 (see FIG. 2) having an image recorded thereon and discharged by the switchback rollers 34. As shown in FIG. 15, the auxiliary tray 140 has a recess 140A for housing therein a stopper 141. The recess 140A is located in the top surface of the auxiliary tray when the discharge tray 80 is in the receiving position. The recess 140A is located at the front end of the auxiliary tray 140 when the discharge tray 80 is in the receiving position.

The stopper 141 is supported by the auxiliary tray 140 such that the stopper 141 is pivotable in a pivoting direction 142 shown in FIG. 15. The stopper 141 pivots between the position in which the stopper 141 is housed in the recess 140A and a stopping position in which its pivoting end is positioned above the top surface of the auxiliary tray 140. When the stopper 141 is in the stopping position, a leading edge (that is, a front edge) of the sheet 54 having an image recorded thereon and ejected by the switchback rollers 34 comes into contact with the stopper 141. Accordingly, the sheet 54 is prevented from falling from the discharge tray 80 and the auxiliary tray 140.

Now, the operation for moving the second tray 70 of the tray unit 50 in the front-back direction 52 will be described. When the user grabs the release lever 105 and the operation lever 73, the lock member 101 is moved out of the lock hole 62B. When the user moves the release lever 105 and the operation lever 73 forward or backward while grabbing the release lever 105 and the operation lever 73, the second tray 70 is moved from the retracted position to the feeding position or from the feeding position to the retracted position. Then, when the user releases the release lever 105 after sliding the second tray 70, the lock member 101 is pushed rightward by the urging force of the first spring 71E and is moved from a retracted position to a projecting position. If the second tray 70 is in the feeding position or the retracted position, the lock member 101 is fitted into the corresponding lock hole 62B. The user determines whether or not the lock member 101 has been fitted to one of the lock holes 62B from a tactile sensation or a sound, and pulls or pushes the operation lever 73 if the lock member 101 has not been fitted to one of the lock holes 62B. The lock member 101 slides along the inner surface of the right side wall 62 of the main tray 60, and is fitted to one of the lock holes 62B when the second tray 70 reaches the feeding position or the retracted position.

When the second tray 70 is moved from the feeding position to the retracted position, the connecting pieces 91 enter the cut portions 72F in the second tray 70 and the engagement ribs 77 are placed between the base 81 and the hook pieces 92. When the second tray 70 is moved from the retracted position to the feeding position, the connecting pieces 91 leave the cut portions 72F in the second tray 70 and the engagement ribs 77 move out from between the base 81 and the hook pieces 92.

Next, the operation for opening the discharge tray 80 of the tray unit 50 from the receiving position while the second tray 70 is in the retracted position will be described.

In this state, as described above, the engagement ribs 77 on the pivoting portion 72 of the second tray 70 are placed between the base 81 and the hook pieces 92 of the discharge tray 80 in the up-down direction 51. However, the engagement ribs 77 are not in contact with or engaged with the hook pieces 92 of the base 81. Therefore, the second tray 70 moves smoothly, without being blocked by the hook pieces 92, from the feeding position to the retracted position. Then, when the discharge tray 80 is opened by the user, the engagement ribs 77 are caught by the hook pieces 92 from below. Since the sliding portion 71 is locked in the front position by the lock member 101, the pivoting portion 72 is pivoted, around the first support portion 71C provided on the sliding portion 71,

17

together with the discharge tray 80. Thus, the loading port 65B of the main tray 60 is exposed when the user opens the discharge tray 80 and the pivoting portion 72 together. The user supplies the first sheets 54A to the main tray 60 through the loading port 65B in the exposed state. If the discharge tray 80 is opened while the second tray 70 is in the feeding position, only the discharge tray 80 is opened. In such a case, since the second tray 70 is in the feeding position, the loading port 65B of the main tray 60 is not covered by the second tray 70. Therefore, the loading port 65B is exposed by opening the discharge tray 80.

Next, the operation for opening the discharge tray 80 of the tray unit 50 from the receiving position while the second tray 70 is in the feeding position, and moving the second tray 70 from the feeding position to the refracted position, and then closing the discharge tray 80 will be described.

When the discharge tray 80 is closed, the inclined surfaces 93 of the hook pieces 92 come into contact with the projecting ends of the engagement ribs 77 provided on the pivoting portion 72 of the second tray 70. When the projecting ends come into contact with the inclined surfaces 93, the connecting pieces 91 are bent so as to allow the hook pieces 92 to move to below the engagement ribs 77, and then the connecting pieces 91 return to their original shapes. Thus, the discharge tray 80 is closed without causing any damage to the hook pieces 92 or the connecting pieces 91 even when the second tray 70 is in the retracted position.

In the present embodiment, the sheets 54 fed by the feed rollers 23 are switched between the first sheets 54A placed on the bottom 61 of the main tray 60 and the second sheets 54B placed on the pivoting portion 72 of the second tray 70 by moving the second tray 70 between the feeding position and the retracted position.

In the present embodiment where the discharge tray 80 is provided as a cover for covering a portion of the second tray 70 from above, the second tray 70 and the discharge tray 80 are configured to pivot together. Although, in the present embodiment, the discharge tray 80 is provided in the tray unit 50, a discharged sheet receiver that serves as the discharge tray 80 may be provided in the printer housing 12, and a cover may be provided in the tray unit 50 separately from the discharged sheet receiver.

Since the second tray 70 and the discharge tray 80 are separate components, the discharge tray 80 does not move as the second tray 70 slides. Accordingly, the discharge tray 80 can be placed above the second tray 70 at a position closer to the switchback rollers 34, and the discharged sheets 54 can be reliably received by the tray unit 50. In addition, since only the second tray is slidable, the discharge tray 80 can be disposed at a high position as desired without causing an interference with the recording unit 40. In particular, in a case where the return path 31B for achieving double-sided printing is provided in the image recording device 10 and a case where a mechanism or a substrate for achieving an additional function is disposed around the recording unit 40, it is necessary to position the recording unit 40 higher by an amount corresponding to the space occupied by the return path 31B, the mechanism, and the like. In such a case, if a discharged sheet receiving portion is formed integrally with a second tray, unlike the present embodiment, the vertical distance between the discharged sheet receiving portion and the discharge unit (switchback rollers 34) may increase and cause a sheet discharging failure due to curling or reversing of the discharged sheet.

In the present embodiment, from the state in which the second tray 70 is in the retracted position and the loading port 65B of the main tray 60 is covered by the pivoting portion 72

18

of the second tray 70 and the discharge tray 80, the pivoting portion 72 and the discharge tray 80 are pivoted together by the engagement between the hook pieces 92 of the discharge tray 80 and the engagement ribs 77 of the pivoting portion 72. Thus, the loading port 65B is opened and the first sheets 54A can be loaded into the main tray 60.

In the present embodiment, since the second tray 70 comprises the sliding portion 71 and the pivoting portion 72, the second tray 70 is slidable and pivotable. In addition, since the pivot axis of the pivoting portion 72 substantially coincides, in position, with the pivot axis of the discharge tray 80, the pivoting portion 72 and the discharge tray 80 can be pivoted together without causing a displacement between the pivoting portion 72 and the discharge tray 80. Thus, the user can open the discharge tray 80 integrally with the pivoting portion 72 of the second tray 70. Instead of the above-described structure, a pair of ribs may be formed on the inner surfaces of the side walls 62 of the main tray 60, and the second tray 70 may be supported on the ribs such that the second tray 70 is slidable and pivotable.

In addition, in the present embodiment, the sliding portion 71 of the second tray 70 is locked in the front position or the back position by fitting the lock member 101 to one of the lock holes 62B. In addition, the user can recognize that the sliding portion 71 of the second tray 70 has reached the front position or the back position from a tactile sensation or a sound generated when the lock member 101 is fitted to one of the lock holes 62B. However, the structure of the lock member 101 and the lock holes 62B is not limited to the above-described structure as long as the second tray 70 can be retained in the feeding position and the retracted position. Recesses or the like may be formed instead of the lock holes 62B.

In the present embodiment, the engagement ribs 77 are provided at a position relatively close to the pivoting end of the pivoting portion 72 of the second tray 70. Therefore, the operating force which must be applied by the user to open the pivoting portion 72 and the discharge tray 80 together can be reduced.

In addition, in the present embodiment, when only the discharge tray 80 is opened while the second tray 70 is in the feeding position and then the discharge tray 80 is closed after the second tray 70 is moved to the retracted position, the connecting pieces 91 are bent so as to allow the hook pieces 92 to move to below the engagement ribs 77. Thus, the discharge tray 80 can be closed without causing any damage to the hook pieces 92 or the connecting pieces 91.

In the present embodiment, the hook pieces 92, the connecting pieces 91, and the base 81 are formed integrally with each other by using synthetic resin material. Alternatively, a leaf spring which is fixed, at its one end, to the base 81 and, at its other end, to the hook piece 92 may be used as the connecting piece 91. Although, in the present embodiment, the hook piece 92 is positioned below the second tray 70 and is configured to catch the second tray 70 from below the second tray 70, the hook piece 92 may be configured differently as long as the second tray 70 can change its position in response to the positional change of the discharge tray 80. For example, the hook piece 92 may be disposed below the top surface of the second tray 70 and the engagement rib 77 may be formed at an intermediate position of the second tray 70 in the up-down direction 51 such that the engagement rib 77 is caught by the hook piece 92. In addition, the hook piece 92 may, of course, engage with the engagement rib 77 not only when the discharge tray 80 is moved from the receiving position to the loading position but also when the second tray 70 is moved to the refracted position.

19

Further, the connecting piece **91** may be formed by a leaf spring which is elastically deformable.

In another embodiment, the hook piece **92** may be supported by the base **81** such that the hook piece **92** is slidable in the left-right direction **53**. In this case, the hook piece **92** is slidable between an engaging position to catch the engagement rib **77** of the pivoting portion **72** of the second tray **70** and a non-engaging position not to contact the engagement rib **77**. The hook piece **92** is urged by a spring, such as a leaf spring or a coil spring, in a direction from the non-engaging position to the engaging position. When the discharge tray **80** is opened while the second tray **70** is in the feeding position and then the discharge tray **80** is closed after the second tray **70** is moved to the retracted position, the engagement rib **77** slides along an inclined surface, which is similar to the above-described inclined surface **93**, on the hook piece **92** so that the hook piece **92** is moved from the engaging position to the non-engaging position. Thus, the hook piece **92** are moved to below the engagement rib **77**.

In another embodiment, instead of the engagement rib **72** of the pivoting portion **72**, an engagement member may be provided on the pivoting portion **72** such that the engagement member is slidable in the left-right direction **53**. In this case, the engagement member is configured to slide between an engaging position to be caught by the hook piece **92** and a non-engaging position not to contact the hook piece **92**. The engagement member is urged by a spring, such as a leaf spring or a coil spring, in a direction from the non-engaging position to the engaging position. When the discharge tray **80** is opened while the second tray **70** is in the feeding position and then the discharge tray **60** is closed after the second tray **70** is moved to the retracted position, the engagement member slides along an inclined surface, which is similar to the above-described inclined surface **93**, on the hook piece **92** so that the engagement member is moved from the engaging position to the non-engaging position. Thus, the hook piece **92** is moved to below the engagement member.

While the invention has been described in connection with embodiments of the invention, it will be understood by those skilled in the art that variations and modifications of the embodiments described above may be made without departing from the scope of the invention. Other embodiments will be apparent to those skilled in the art from a consideration of the specification or practice of the invention disclosed herein. It is intended that the specification and the described examples are considered merely as exemplary of the invention, with the true scope of the invention being defined by the following claims.

What is claimed is:

1. A tray unit comprising:

a first tray comprising a first holding surface for holding thereon a first sheet;

a second tray comprising a second holding surface for holding thereon a second sheet, wherein the second tray is configured to slide above and along the first holding surface between a first second-tray position and a second second-tray position, and configured to pivot between the second second-tray position and a third second-tray position in which the second tray stands upward with respect to the first holding surface; and

a cover configured to cover from above at least a part of the second tray when the second tray is in the second second-tray position, and configured to pivot between a first cover position in which the cover extends along the first holding surface and a second cover position in which the cover stands upward with respect to the first holding surface,

20

wherein a pivot axis of the second tray moves relative to a pivot axis of the cover as the second tray slides between the first second-tray position and the second second-tray position.

2. The tray unit according to claim 1,

wherein the second tray comprises an engaged portion, and wherein the cover comprises an engaging portion configured to engage with the engaged portion of the second tray when the cover pivots from the first cover position to the second cover position.

3. The tray unit according to claim 2, wherein the engaging portion of the cover in the first cover position is disposed below the engaged portion of the second tray in the second second-tray position.

4. The tray unit according to claim 2, wherein the engaging portion of the cover in the first cover position is not in contact with the engaged portion of the second tray in the second second-tray position, and the engaging portion of the cover engages with the engaged portion of the second tray when the cover pivots from the first cover position to the second cover position.

5. The tray unit according to claim 2, wherein the engaging portion of the cover is disposed at a position closer to a pivoting end of the cover than to the pivot axis of the cover.

6. The tray unit according to claim 2, wherein when the cover pivots from the second cover position to the first cover position while the second tray is in the second second-tray position, at least one of the engaging portion and the engaged portion is configured to elastically deform upon contact of the engaging portion with the engaged portion, such that the engaging portion moves to below the engaged portion.

7. The tray unit according to claim 6, wherein the second tray comprises a cut portion formed in an upstream end thereof in a sliding direction of the second tray from the second second-tray position to the first second-tray position, and the engaging portion of the cover projects from the connecting member in a direction crossing the sliding direction of the second tray, and the connecting member is configured to enter the cut portion when the second tray slides from the first second-tray position to the second second-tray position.

8. The tray unit according to claim 2, wherein the cover comprises a base configured to extend along the first holding surface when the cover is in the first cover position, and a connecting member disposed at a position not interfering with sliding of the second tray and connecting the engaging portion to the base.

9. The tray unit according to claim 2, wherein at least one of the engaging portion of the cover and the engaged portion of the second tray comprises an inclined surface which is inclined with respect to a pivoting direction of the cover, and the other of the engaging portion and the engaged portion is configured to make slide contact with the inclined surface when the cover pivots from the second cover position to the first cover position while the second tray is in the second second-tray position.

10. The tray unit according to claim 1, wherein a pivot axis of the second tray in the second second-tray position coincides, in position, with the pivot axis of the cover.

11. The tray unit according to claim 1,

wherein the first tray comprises a pair of side walls extending along a sliding direction of the second tray and opposed to each other in a direction parallel to the first holding surface and perpendicular to the sliding direction, and

wherein the second tray comprises a sliding portion slidably supported by the pair of side walls, and a pivoting portion pivotably supported by the sliding portion.

21

12. The tray unit according to claim 1, wherein the first tray comprises two first positioning members spaced apart from each other in a sliding direction of the second tray, and wherein the second tray comprises a second positioning member configured to engage with one of the first positioning members when the second tray is in the first second-tray position, and with the other of the first positioning members when the second tray is in the second second-tray position.
13. The tray unit according to claim 12, wherein the first tray comprises a side wall standing upward from the first holding surface and extending along the sliding direction of the second tray, and each of the first positioning members has a recess formed in the side wall, wherein the second positioning member comprises a lock member configured to move between a projecting position and a retracted position relative to each of the recesses, and the second tray comprises an urging member configured to urge the lock member toward the projecting position.
14. The tray unit according to claim 1, further comprising an indicating mechanism configured to change indications depending on whether the second tray is in the first second-tray position or the second second-tray position.
15. The tray unit according to claim 14, wherein the indicating mechanism comprises an indicator comprising an indicator contact portion and configured to move from a first indicator position to a second indicator position when the second tray pushes the indicator contact portion.
16. The tray unit according to claim 15, wherein the cover pivotably supports the indicator, and the indicating mechanism comprises an urging member configured to urge the indicator from the second indicator position toward the first indicator position.
17. The tray unit according to claim 15, wherein the second tray comprises a second-tray contact portion disposed at an upstream end thereof in a sliding direction of the second tray from the second second-tray position to the first second-tray position and configured to contact the indicator contact portion when the second tray slides.
18. The tray unit according to claim 17, wherein the second-tray contact portion comprises an inclined surface which is inclined with respect to the sliding direction of the second tray and a pivoting direction of the cover.
19. The tray unit according to claim 17, wherein the second tray comprises a receiving portion disposed outside the second holding surface and configured to receive the cover when the cover pivots to the second cover position while the second tray is in the first second-tray position.
20. The tray unit according to claim 1, wherein the cover comprises a holdable portion configured to receive an external force for pivoting the cover.
21. The tray unit according to claim 1, wherein the cover comprises a cover portion configured to cover a side face of the second tray that intersects the second holding surface.
22. The tray unit according to claim 1, wherein the cover has an opening elongated in a sliding direction of the second tray, the second tray comprises an operation lever configured to be exposed through the opening, and the cover comprises a mark disposed adjacent to the opening and indicating information about at least one of a position of the second tray and types of the first and second sheets.
23. The tray unit according to claim 1, wherein the cover comprises a pivot shaft supported by the first tray.

22

24. The tray unit according to claim 1, wherein a pivoting end of the cover is received by the first tray.
25. An image recording device comprising:
a first tray comprising a first holding surface for holding thereon a first sheet;
a second tray comprising a second holding surface for holding thereon a second sheet, wherein the second tray is configured to slide above and along the first holding surface between a first second-tray position and a second second-tray position, and configured to pivot between the second second-tray position and a third second-tray position in which the second tray stands upward with respect to the first holding surface;
a cover configured to cover from above at least a part of the second tray when the second tray is in the second second-tray position, and configured to pivot between a first cover position and a second cover position, the cover comprising a pivot shaft supported by the first tray;
a feeder configured to feed the first sheet when the second tray is in the second second-tray position and to feed the second sheet when the second tray is in the first second-tray position;
a recording unit configured to record an image on the sheet fed by the feeder; and
a discharging unit disposed above the cover and configured to discharge the sheet after the recording unit records the image on the sheet,
wherein the cover comprises a plate portion configured to extend along the first holding surface of the first tray when the cover is in the first cover position and configured to stand upward with respect to the first holding surface when the cover is in the second cover position, and, when the cover is in the first cover position, a first surface of the plate portion is configured to receive the sheet discharged by the discharging unit and a second surface of the plate portion opposite to the first surface faces toward the first holding surface, and
wherein the cover is configured to pivot between the first cover position and the second cover position independently from and relative to the second tray when the second tray is in the first second-tray position.
26. The image recording device according to claim 25, wherein the cover comprises a third tray configured to move between a receiving position in which the third tray cooperates with the first surface of the plate portion to receive the discharged sheet, and a stored position in which the third tray is stored in the cover, and wherein the third tray comprises a stopper configured to project in a direction crossing a direction in which the sheet is discharged by the discharging unit and to stop the discharged sheet.
27. The image recording device according to claim 25, further comprising a housing, wherein the first tray, the second tray, and the cover are configured to be mounted into and removed from the housing unitarily as a tray unit.
28. The image recording device according to claim 27, further comprising a convey path forming member disposed above the tray unit and configured to pivot between a guide position in which the convey path forming member defines a convey path for guiding the sheet, and an open position in which the convey path forming member opens the convey path,
wherein the tray unit comprises a contact portion configured to push the convey path forming member from the open position to the guide position when the tray unit is mounted into the housing.